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FIRE INSURANCE.

A HAND BOOK FOR INSURANCE AGENTS.

BY
FRANK R. FAIRWEATHER,
ST. JOHN, N. B.

WITH ARTICLES ON THE DUTIES OF AGENTS AND SUB-AGENTS, AND A DIGEST OF THE FIRE INSURANCE CASES OF THE MARITIME PROVINCES OF CANADA.

BY
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ST. JOHN, N. B.

ST. JOHN, N. B.
THE ST. JOHN GLOBE PUBLISHING COMPANY LIMITED.
1900.

INTRODUCTION.

By A. A. Stockton, LL.D., D.C.L., Q.C.

THE business of Fire Insurance is one which more or less deeply affects the welfare of all classes. More than fifty years ago an eminent legal writer said, respecting this department of business: "At no former period in the history of civilization has the law of insurance assumed the importance or awakened the interest which belongs to it at the present time in nearly every part of the civilized world." The statement holds good as to its importance and status at the present day.

Professional men and agents of insurance companies are expected to have knowledge of the business; but it is important that those taking out policies of insurance for protection against loss should also have some intelligent knowledge of the rights and duties of insurer and insured. This work by Mr. Frank R. Fairweather in a concise manner imparts valuable information. The statement of principles and law is clear and practical, and the book will no doubt receive that patronage which it merits. The author has had large practical experience in the insurance business, and therefore writes with a knowledge begotten of actual work. A special feature of the book is the digest of all fire insurance cases decided by the Supreme Court of New Brunswick, Nova Scotia and Prince Edward Island. This digest is the work of the late Mr. Reginald R. Fairweather, B.C.L., Barrister-at-Law, whose special fitness for the task was so well known to the legal profession. His early and lamented death cut short the promise of a brilliant and useful career at the Bar. The digest was not fully completed at the time of Mr. Fairweather's death. It has since been completed by his friend and class-mate Mr. L. V. DeBury, B.A., B.C.L., Barrister-at-Law, whose qualifications for the self-imposed work are readily acknowledged. This digest will be especially useful to the practising lawyer. The book is confidently recommended to the favorable judgment and patronage of the public, with an expression of hope that the author may receive a generous reward for the labor bestowed in the production of a valuable and useful work.

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PREFACE.

ALTER ALTERIUS ONERA PORTATE.

"The business which will not pay insurance is not worth following." As fire insurance is regarded as a necessary expense attending all business, and as the cost thereof is directly determined by the loss ratio in the districts, states, or provinces, grouped together in the territories regarded by the head offices of companies as "fields," so, therefore, all knowledge which can be given to fire insurance agents and to the public, explaining the causes of fire and the ordinary precautions necessary to guard against these causes, is beneficial to the community in the end.

For if the Maritime Provinces of Canada, generally grouped together by the head offices as one field, where certain conditions exist and where certain rates must be applied to make the ordinary profit of the business, should show for a number of years a ratio of loss below the ordinary, then it would be perfectly fair for the people to apply for a reduction in the rates prevailing during the time the extraordinary profit was made.

And it need not be supposed that the causes of fires are in themselves of an abstruse nature and difficult of comprehension to the ordinary mind, for many of the fires which occur result from causes so simple in themselves and so easily guarded against that it is surprising a fire should ever have been allowed to happen.

Yet happen they do and happen they will, so long as ignorance of the cardinal principles relating to combustion prevails, while the loss goes into the ever increasing statistics and helps to keep the rates at high level.

It shall be, then, our plan in this little work to deal with the simple and ordinary causes of fires, combined with some instruction about illuminants such as acetylene, electricity, gas and kerosene, and instruction about fire insurance generally.

This work is especially designed as a manual for fire insurance agents throughout these Maritime Provinces. On them lies the chief duty of extending this information to their clients, and by so doing help to make their agency a profitable one for the company they represent.

We have to acknowledge our indebtedness for much of the matter contained in this work to the following publications :

Griswold's "Fire Underwriters' Text Book."

The "Chronicle" Fire Tables.

The Universal Schedule.

The Special Agent's Companion.

The Hand Book of the Underwriter's Bureau of New England.

Hine's Instruction Book for Fire Insurance.

A number of valuable pamphlets from the New England Insurance Exchange.

Cushing's Standard Wiring for electric light and power.

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FIRE INSURANCE.

The Early History of Fire Insurance in St. John.

THE history of fire insurance in St. John shows a gradual development, keeping pace with the growth of the city.

The extent of this development may be estimated by the fact that in 1827 there were but two or three companies in St. John, while in the present year (1899) there are thirty-four.

Since the year 1850, a number of the large English and American companies have established agencies in the city, and in the course of time, as the business extended and sub-agencies were located in the principal towns outside, the offices at St. John in many cases became the head offices for the province.

As the business increased the methods of conducting it became more advanced. At first there were general rates applying on dwellings, and on stores, and stocks, and special risks; the brick buildings and contents, of course, costing less to insure than the wooden ones. Later, however, the New Brunswick Board of Fire Underwriters was formed and more scientific minimum ratings were adopted. In 1873, the first attempt was made to rate the city specifically, and this method has continued since, so that now every building in St. John has its own rate fixed upon it by the Board. At the present time, the rating of specials — such as factories, mills, etc., is done by the application of scientific principles, as laid down by the best authorities in the United States.

From its headquarters at St. John, the New Brunswick Board of Fire Underwriters, having the distinction of being the oldest board in Canada, exercises jurisdiction over the whole province, and as a rule its ratings are respected and observed, and its mandates obeyed.

The early history of fire insurance in St. John, as it has slowly developed since 1827, is a tribute to the endurance, tenacity and pluck of the British and American companies which

first opened agencies in the city. Probably all the companies located here, prior to 1877, or about one-half of the number now having agencies in the city, have paid out more money in losses and expenses than they have received in premiums. For this, of course, the great fire of 1877 is largely responsible, but in addition to this a number of other fires have occurred, which, but for their being dwarfed by comparison with the Great Fire, would have appeared as notable conflagrations in the history of any community.

Seldom has a city been so often and so disastrously devastated by this great agent of destruction.

Even from the time of the first early settlers fire has seemed to mark the city for its own, but the indomitable citizens have always built after each disaster buildings of better construction and more architectural beauty; so that the city has risen again and again, Phœnix-like, from the ashes of the past.

The great fire of June, 1877, caused a property loss of $15,000,000, the insurance loss being $6,576,323, distributed as follows:

North British and Mercantile,	$892,792
Queen,	723,683
Imperial,	565,312
Royal,	496,271
Northern,	475,162
Liverpool and London and Globe,	465,032
Guardian,	417,106
Lancashire,	375,508
Commercial Union,	356,063
Royal Canadian,	337,052
Stadacona,*	313,425
Ætna,	245,000
Citizens of Montreal,	138,642
Hartford,	136,478
National of Montreal,†	113,392
Provincial of Toronto,*	110,000
Western of Toronto,	95,954
Phœnix of Brooklyn,	68,872
Central,	55,000
Canada Fire and Marine,†	51,840
British America,	37,739
Canada Agricultural,	8,000
St. John Mutual, say,‡	75,000
Maritime Mutual, say,‡	25,000
Total,	$6,576,323

* *Suspended.* † *Eventually Suspended.* ‡ *Disappeared.*

Probably the first insurance ever effected in St. John was that on Benedict Arnold's buildings. Arnold arrived in St. John in 1785, and purchased a lot at Lower Cove. On this lot he erected a store, and went into business with Munson Hoyt as a partner. He seems also to have had another store on King Street, for we find, that on the suggestion of his friends in England, he effected insurance on the Lower Cove building to the extent of £1000, and on stock £4000, and on stock in the King Street store £1000. On the night of the eleventh of July, 1788, the Lower Cove store with its contents was burned. This store was filled with a valuable stock of goods, and with all its contents was totally destroyed.

The impression was at the time that this fire was caused by design for the purpose of defrauding the insurance company. Arnold's two sons, Richard and Henry, slept in the store the night of the fire, and neither of them could give a satisfactory account of its cause.

That the early inhabitants of the city believed the loss to be fraudulent, or at least suspicious, is evidenced by the following fact: Nearly two years afterwards, Munson Hoyt, from whom Arnold had separated, charged the latter with setting fire to the building. On this the General instituted an action for slander, claiming £5000 damages, and retaining Attorney General Bliss and Solicitor General Chipman. Hoyt's counsel was Elias Hardy. The jury gave the plaintiff twenty shillings damages.

On the other hand, however, we must state that Isaac N. Arnold, a biographer of Benedict Arnold, characterizes this accusation as a baseless and cruel charge, and as one of the many slanders circulated about the General. Whether this gentleman is any more worthy of credence than the people who were on the spot at the time of the occurrence, is a question that we cannot determine. His geographical knowledge is at least defective. He states Arnold removed to *St. Johns*, N. B., in 1787, and that many loyalists had settled on this *island*. (Page 370, Life of Benedict Arnold, by Isaac N. Arnold.)

We find no further record of any further fire insurance transactions until 1827. In this year the Ætna and Hartford

established themselves in St. John, their first agent being Alexander Balloch.

About this time the Mutual Fire Insurance Company of St. John was organized, with Isaac Woodward as first agent. This company had a long life, and was regarded with a certain amount of confidence. It boasted of a house plate, consisting of two clasped hands. These house plates were attached to the buildings insured in this company. The Mutual lasted until the great fire of 1877, when it disappeared, leaving unpaid losses amounting to $75,000.

Between 1830 and 1850 various American companies came to St. John.

Another local company, "The King's County Mutual," was started, and was in existence as early as 1847, with Justus Earle as secretary, but soon came to an end.

The "Central," of Fredericton, established in 1836, came to St. John between the years 1840 and 1850. George Thomas was first agent, and although this company lost $55,000 in the St. John fire of 1877, it weathered the disaster, and is still in the field.

In 1851 came the "Liverpool and London and Globe," and "Royal," the first two English companies to open agencies in St. John, though followed later, at various dates, by a number of the best of the great British companies. Edward Allison was the first agent of the "Liverpool and London and Globe," and J. J. Kaye of the "Royal."

A feature of the earlier years of fire insurance in this province, was the number of American and local companies. We have already mentioned the "St. John Mutual," "The King's County Mutual," "The Globe," and "Central," but besides these there were "The Maritime Mutual," the "Provincial" of Toronto, the "National" of Montreal, the "Canada Fire and Marine," the "Croton" of New York, the "Canada Agricultural," the "Lorillard," the "Harmony," the "Stadacona," the "Morris," and the "Niagara," insurance companies.

A number of these suspended after the great fire of 1877, some disappeared from that date, and the rest seem to have sunk

into the dim obscurity of the past — "unwept, unhonoured and unsung;" or to have retired from the field, as we no longer hear of them in the insurance world.

We think, however, that the heavy fire record of St. John, has been a factor, in late years, in keeping out an undesirable class of "wildcats," or unreliable companies. Indeed only those fire companies which were firmly established could stand the frequent and heavy calls made upon them.

Between 1851 and 1866 (when the first board was formed), the following well known companies appeared in St. John, viz: the "Queen," the "North British and Mercantile," the "Phœnix of London," the "London and Lancashire," and the "Lancashire." Besides these there were the "Times and State," the "Western" of London and Bristol, the "Arctic," the "Home," and the "Albert."

THE EARLY FIRE PROTECTION.

The first record we have of any attempt at fire protection for the city is in 1786. In February of this year the corporation paid Peter Fleming £136 6s. 8d. for two fire engines. These could not have been very satisfactory, for in the following year we find a number of the citizens who — "Taking into our serious consideration the alarming situation of our city, for want of fire engines and public wells, should a fire break out in any part of it," etc.; — subscribed the amount of £384 13s. 4d., for the purpose of buying London engines and sinking wells. The principal wells were located in King Square, Blockhouse Hill (that is in the vicinity of Centenary Church), Princess Street near Charlotte, Queen Square, the foot of Poorhouse Hill, and in Portland. In 1820 an agitation was made for a better supply of water, but it was not until 1825 that the question took definite shape, and an act for the incorporation of a water company, with a capital of £10,000, passed the Legislature. With the first funds of this company a number of new wells were sunk.

In 1837 The St. John Water Company was regularly organized, surveys were made, waterworks were built, and the first practical attempt at bringing water into the city from Lily Lake was carried out. The water was not brought, as in the opinion of eminent engineers it should have been, directly from Lily Lake to the city by its own gravitation, but was taken from the tail, near Gilbert's Mill, and conducted thence by a sluice to a reservoir, or cistern, which was placed a few yards to the southwest of the Marsh Bridge. An engine and pumping house was erected over the cistern, a steam engine and gear procured, and the water was sent through a 10-inch main to the reservoir on Blockhouse Hill. The supply passed through a very limited number of pipes, and the inhabitants, up to 1850, could only get water for two hours each morning. A sufficient supply had to be drawn during the two hours the water was turned on to last for the twenty-two it was off; and when a fire broke out no water could be had for its extinction until the "tank" or reservoir on Blockhouse Hill was opened and the mains filled. The time usually lost in this way was from fifteen to thirty minutes, but sometimes it was much more, when from any cause the alarm was delayed in reaching the turnkey whose special duty was to turn on and shut off the water. When the fire was serious, or threatened to be so, a messenger had to be dispatched to the Marsh Bridge pumping station to start the steam engine working, so as to supplement the supply in the reservoir, which seldom exceeded 150,000 gallons, and often not one-half of this, as the engine was only run tri-weekly. It was to terminate this most undesirable state of things, and to obtain a more copious and constant supply for fire purposes, and a softer and healthier water for steam and house use, that in 1850 an appeal was made to the citizens on public grounds and they were earnestly solicited to take up new shares of the Water Company which were offered for sale. The money from this source was to be applied to the bringing of water from Little River at Scott's Mills, five miles distant from the city. The site at Scott's Mills was purchased, a small dam built, and a 12-inch main was laid. The same main is still perfect and works as well as ever.

In 1855 the stock and works of the Water Company were transferred to the Commissioners of Sewerage and Water Supply for St. John (East) and the Parish of Portland.

In 1857 a 24-inch main, in addition to the 12-inch main, was laid from the reservoir at Little River. This main came across the Marsh Bridge, and was connected together with the 12-inch main with an iron chamber, from which the water flowed into the original 10-inch main running up Brussels Street to the reservoir.

In 1873 a second 24-inch main was laid, partly to increase the pressure which had begun to weaken on account of the increased consumption, and partly to duplicate the pipes leading to the city, so that in case of an accident happening to either of the 24-inch mains, requiring the water to be shut off, the city would not be wholly dependent upon the old 12-inch main. These three pipes then bring to the city about 350,000 gallons per hour, and the supply is distributed by 280,000 feet of pipe of different sizes, from the mains of St. John East and North, of 15, 12, 10, 8 and 6-inch to service pipes of ½-inch for the domestic service of houses.

Turning to the fire apparatus, we find in 1850 there were six hand fire engines, one hose cart, and one hook and ladder truck. The fire alarm system, up to 1852, consisted of a large gong on a scaffold in King Square. In 1851 the historic Bell Tower was erected at the head of King Street, and a large bell placed there in 1852. This was tolled for a fire alarm up to 1867, when the present system of fire alarm boxes was installed. The Bell Tower was destroyed in the fire of 1877. The fire department in the early days, with its antique hand fire engines, was entirely volunteer. There were no paid men, but those serving were granted certain civic exemptions.

This volunteer fire department was first called into existence after the York Point fire of March, 1849, and the customs and regulations were arbitrary and peculiar. One old custom was a prize given to the company drawing first water at a fire. This led, at times, to serious results. For instance, a member of one company discovering a fire would not notify the nearest engine,

but would run for his own, so as to be first at the blaze and win the prize. Or when two of the engines had hurried to the scene of the fire, and perhaps reached the nearest hydrant together, a battle royal would ensue in which the heavy wrenches were freely used, while to the dismay of the fire insurance agent the fire would be spreading merrily. Pumping on these hand fire engines was compulsory — all bystanders were liable to be called on, and refusal to comply meant imprisonment and fine. There was great rivalry amongst these volunteer companies, and on one occasion a Protestant company turned on No. 4, the Roman Catholic company, and a desperate fight ensued, in which No. 4 was routed and their engine taken from them. The engine was then taken to the top of King Street, and allowed to drive down the steep hill into the water.

The hand fire engines were gradually superseded after 1863. In the early part of this year steam fire engines were purchased, and these were first used at a fire on the twelfth of March, 1863.

We find in the year 1867 that the fire department consisted of the following: Three steam fire engines and a large number of hand engines, with an ample supply of hose, ladders, buckets, etc.; and paid firemen in the place of the volunteers who had disbanded a short time previous to this.

The water pipes at this date had been laid through all the principal streets. There were also corporation ordinances relative to the proper security of flues and stoves, and limits in the principal business parts of the city where no frame buildings were allowed to be erected.

The old rates charged seem to have been as follows:

Frame stores, from	1½% to 2%
Frame dwellings, detached,	1%
Brick buildings were charged,	½%, stocks ¾%

Prior to the first regular tariff of 1866, the rates were:

On detached brick stores,	⅝%
Stores in brick blocks,	⅝% to ¾%
On detached frame stores,	1¼% to 1¾%
Detached brick dwellings,	¼% to ⅜%
Detached frame dwellings,	1% to 1¼% and upwards
Steam saw mills,	5%, 6% and 7%
Water power saw mills,	2½% to 3%
Cotton and woollen mills,	3% to 3½%
Soap and candle factories,	3½% to 4%
Boot and shoe, sewing machine and other factories,	1½% to 3½%

Three year policies at two years' rates on dwellings, churches, schools, etc., were issued from about 1873, and up to the fire of 1877. After that until 1890 none were allowed in the city, although still issued in the country. In 1890 they came into general use in the city.

In 1866 the first tariff was issued. It was a small affair of minimum rates, and containing two tables, one of short term rates and the other of ship rates, both in pounds, shillings and pence. It was, however, a serious attempt to discriminate amongst the different classes of risks, and was an evidence of the gradual evolution of the business.

This tariff still allowed the agent some latitude, as for instance on wooden buildings, connected or exposed, the rate is given as $1\frac{1}{4}\%$ to 3%; or on different classes, such as water power saw mills, woollen mills, paper mills, soap and candle factories, tanneries, coach builders, and stocks, if in wooden buildings from $2\frac{1}{2}\%$ to 4%, and where steam power is used $1\frac{1}{2}\%$ additional; thus allowing the agent to start at the higher rate and get what he could out of the insured.

In 1866 then, as we have seen, the first tariff was issued, and the New Brunswick Board of Fire Underwriters was formed. The companies, and the agents who represented them, and who agreed to abide by these ratings, were the following:

G. Thomas, Agent of the Central.
Edward Allison, Agent of the Liverpool and London and Globe.
James J. Kaye, Agent of the Royal.
W. J. Starr, Agent of the Continental and Lorillard Insurance Co's.
George Stymest, Agent of the Queen.
C. W. Weldon, Agent of the Phœnix of London.
Thomas & Wetmore, Agents of the Phenix and Harmony Ins. Co's.
W. C. Perley, Agent of the London and Lancashire.
Henry Jack, Agent of the North British and Mercantile.
Robertson & Philps, Agents of the Niagara and Morris Ins. Co's.
R. P. & W. F. Starr, Agents of the Lancashire.

In January, 1870, we find the board regularly installed, with Edward Allison, president, and C. E. L. Jarvis as secretary. This year a new and more elaborate tariff of minimum rates was issued. In 1873, the first attempt was made to rate specifically

the whole city. New tariffs have since been published as the city grew in extent.

From this date the insurance business in St. John has gradually been increasing. The smaller companies seem to have retired, or to have been forced out by heavy losses, while on the other hand company after company of the better class has entered the field, and at the present date of writing there are thirty-four companies with agencies or head offices in St. John. Brokerage has, so far, been kept down with an iron hand. The Board has been in existence without a break since its first formation in 1866, and its rates and rulings have been honourably observed.

ILLUMINANTS.

Before commencing to write of the different illuminants used throughout the country, and which constitute the first part of our subject, we would state that we have no idea or intention of disparaging their use, or of ignoring their many good qualities. The good qualities are usually apparent, they show for themselves; but it is the bad qualities and the dangers which require to be known in order to be guarded against. And viewing these different gases, and oils, and electricity, from a purely insurance standpoint, we desire to point out these dangerous features, and also the precautions considered absolutely necessary to prevent accidents and consequent fire loss.

ACETYLENE GAS.

As this gas is now gradually securing a place among the common illuminants, we have deemed it well to investigate its claims, and we give below some information on acetylene, under the following heads, viz.:

1. What it is.
2. Its principal properties, and how it is generated by some of the machines now on the market.
3. Its advantages as an illuminant.
4. Its disadvantages.
5. The Board of Underwriters' rules relating to its installation in Nova Scotia and New Brunswick.

I. — Acetylene Gas.

Acetylene is the result of the action of water on calcium carbide. The gas was first made by Sir Humphrey Davy in 1837, and again in 1862 by Woehler, and first studied in 1859 by Berthelot.

It is a low or heavy hydro-carbon, and is easily liquified at 100 atmospheres' pressure, or under 50 atmospheres' pressure at the freezing point of water. (1 atmosphere = 15 lbs. pressure to the square inch.)

Its formula is $C^2 H^2$, and according to a pamphlet issued by the "Insurance Press," of New York, the gas is very unstable and liable to dissociation of its elements.

The main constituent of acetylene is calcium carbide.

Calcium carbide is a hard, porous, greyish black material, composed of powdered coke and lime dust heated together in an electric furnace. This substance is not affected by heat or acids.

The important point to be noted in connection with calcium carbide is, that it is impossible to ignite it or to generate acetylene gas from it except it is brought in contact with moisture.

This fact serves to explain the stringent regulations of the fire insurance associations in regard to limiting the supply of carbide to be kept in a building and that such supply is stored in air-tight metal cans in a perfectly dry place. The calcium carbide when acted upon by water, yields about five cubic feet of acetylene gas to the pound, and a residue of slacked lime.

The colour of the flame is white, slightly blue white, though not so much so as the Welsbach light, and a candle, or electric light, or gas flame looks yellow and reddish beside it.

The gas was first brought to public notice, commercially, by Professor Willson's work a few years ago. He established a factory at Merriton, Ont., where he fused together Pocahontas coal dust and lime in an electrical furnace, and thus formed the compound calcium carbide. This can be made now for about $20 a ton, and when thrown into water it decomposes instantly, acetylene gas is liberated and slacked lime precipitated.

The chemical process is as follows:

When water and calcium carbide come into contact, a double decomposition is at once set up. The hydrogen of the water combining with the carbon of the calcium carbide, forms acetylene; while the oxygen of the water coalesces with the basic calcium to convert it into calcium hydrate or slacked lime. Thus

all of the carbon of the calcium carbide is absorbed or taken up by the hydrogen, the combination forming a gaseous hydro-carbon of low specific gravity and unstable character containing two atoms each of carbon and hydrogen, while the residuum in the form of slacked lime may again be utilized with coke or coal to produce calcium carbide.

II.—Its Principal Properties and how it is Generated by some of the Machines now on the Market.

Intense heat and pressure are generated when a volume of carbide is acted upon by a small supply of water; such heat and pressure tending to dissociation of the elements of the liberated acetylene, thus producing explosion and ignition. The gas is explosive when mixed with air in any proportion, from 3% to 82%, its maximum of violence being at $8\frac{1}{3}$%. Its energy of explosive force is more intense than other gases, being almost as great as gun cotton. Hydrogen and coal gas, as explosive mixtures with air, range from 5% to 72%, and 8% to 62%, respectively.

Acetylene may be exploded by a spark or heated platinum wire without the presence of air—a feature peculiar to this gas. When acetylene is produced from impure carbide it is liable to contain gases which will ignite spontaneously upon coming in contact with air.

Liquified acetylene is an unstable compound, liable to dissociation of its elements and explosive ignition from shock, elevation of temperature, or friction, as from the escape of the gas, or the turning of a cock or valve. In England it is classed as a dangerous explosive and under the law "may not be manufactured, imported, kept, conveyed, or sold." And according to the rules of leading insurance boards and exchanges the use of liquid acetylene or gas generated therefrom is absolutely prohibited.

When water and calcium carbide are brought together to form acetylene gas, the heat generated may rise to the ignition point of the gas; viz., 900° Fahr., and thus cause self-ignition and

explosion within the generator. This rapid elevation of temperature is most imminent when an excess of calcium carbide is acted upon by a minimum of water, as in the so-called "dry generator," and the possibility of the explosive ignition is augmented by the presence of air in the generator.

If, as in the type styled "wet generators," there is an excess of water sufficient to absorb and dissipate the heat liberated, and also to slack the lime perfectly, the danger of an excessive rise in temperature is materially reduced, if not entirely eliminated. But at the same time, unless the generator be free from air before the evolution of gas takes place, the compound of air and acetylene gas first driven from the generator will be of an explosive nature and continue so to be until acetylene has completely replaced the air within the generator and service pipes.

Rule 8 of the New England Insurance Exchange, in regard to this feature, is as follows: "Apparatus must be so arranged as to contain the minimum amount of air when first started or recharged, and no device or attachment facilitating or permitting mixture of air with the gas prior to consumption, except at the burners, shall be allowed."

"NOTE. — Owing to the explosive properties of acetylene mixed with air, machines should be so designed that such mixtures are impossible."

The danger of self-ignition and explosion of acetylene gas, during and after its liberation from the decomposed calcium carbide and water, would be materially increased should the carbide used be produced from impure materials, and as there are at present no governmental or authoritative tests as to the purity of calcium carbide, the probability of danger from this source is always present. The imminence of this danger is further increased by the fact that absolutely pure calcium carbide is not yet a commercial fact.

Acetylene generators may be broadly classed as of two general types. In the one, a small quantity of calcium carbide is brought into contact with a maximum of water; the residuum of decomposition being of the nature of a fluid.

In the other type the conditions are reversed, and the calcium carbide is in excess and is acted upon by a minimum of water; the residuum being a semi-solid like wet earth.

The first type is known as the "wet," and the second as a "dry" generator.

These systems may be further sub-divided into two classes, viz: Automatic and intermittent, and the other non-automatic, or continuous in operation. In the automatic apparatus the mechanism is such as to permit the coming together of calcium carbide and water at intervals as may be required for the production of gas for consumption, and to cease generation when the consumption is suspended.

This type may be either wet or dry.

The non-automatic or continuous device is one in which acetylene may be produced continuously by replenishing the supply of calcium carbide and storing the gas in a gasometer or gas-holder, in which case the gas-holder serves as a pressure regulator and distributer.

A variation of this device is one in which a fixed charge of water and calcium carbide is converted into gas, sufficient for one night's service, the gas being stored in a gas-holder.

The automatic system of the wet type generator may be classed as follows, viz.: Immersion, Displacement, Dropping.

Immersion.

The charge of carbide is placed within a receptacle suspended within the generator, and is alternately immersed and withdrawn from an excess body of water by the reduction or increase of gas pressure within the generator; there being no change in the level of the water, save that due to its decomposition.

Displacement.

The vessel holding the carbide is stationary and primarily in contact with an excess of water. As gas is evolved by this contact, its pressure serves to drive out, or displace the water

from the generating chamber, but when this pressure becomes reduced by consumption of gas the water rises until it again reaches the carbide, and the process repeats itself in this manner.

Dropping.

Small and fixed quantities of the calcium carbide are automatically dropped into an excess of water; the dropping of the charge being regulated by the decrease of gas pressure due to consumption.

The Characteristics of the Wet Type.

Each of the wet type processes has the valuable feature of an excess of water in the generator. This excess serves to absorb the heat generated by decomposition, and insures the complete liberation of the gas, and the proper slacking of the lime. The residuum is thereby formed as a liquid, which may readily be drawn off, or discharged, without admitting air to the generating chamber. But it is evident in regard to the immersion and displacement devices, that neither is truly automatic in the discontinuation of the production of gas after consumption should have ceased.

The remainder of the charge of carbide will be gradually decomposed by the water retained in it, and by moisture arising from the contiguous body of water in the generating chamber. Hence, a slow but constant evolution of gas will go on, until all the carbide has been decomposed.

This fact renders necessary gas-holders sufficiently large to retain all the gas which may be liberated, or else the pressure due to the increase of gas may be powerful enough to overcome the water seal, and permit the escape of gas to the atmosphere.

The third, or dropping device, is more automatic in its production of gas than either of the others. For, with a gas-holder designed to hold only the quantity of gas generated from each of the small and segregated charges, there can be no over production of gas, and therefore no pressure exerted to break the

water seal. The discharging mechanism is such as to permit the delivery of but one charge of carbide at a time, and only when the decrease of gas pressure serves to operate the delivery device.

This delivery chamber may be so located and arranged as to be replenished without admitting air to the generating chamber. The method and operation of this last system are such as to render it least objectionable to insurance men of any class of generator yet on the market.

The Dry Generator.

This type may be so constructed as to combine both generating and gas-holding chamber in the one device, or have a separate generator and a gasometer to complete the machine. In either case, a maximum charge of carbide is acted upon by a minimum quantity of water, which may be delivered as a spray, or by dropping from a perforated pipe. Another variety of the dry generator has the carbide placed in separate compartments, or pans, connected by water passages, necessitating the overflow of one pan before the water can reach and flow into the succeeding compartment.

This device is the least objectionable of the dry type.

Characteristics of the "Dry Generator."

In the automatic machine of this dry type, the supply of water to the carbide is controlled by the alternate opening and closing of the water supply cock, which is mechanically operated by the change in pressure due to consumption of gas.

Here, as in the wet process, the moisture held by the carbide after the water supply has been cut off, will serve to promote the generation of gas, until the water is decomposed, with the evolution of much heat, due to the rapidity with which the small quantity of water is dissociated by an excess of carbide. This elevation of temperature is intensified when the charge of carbide is so arranged as to prevent the hydrated lime from

being rapidly carried away from the undecomposed mass of carbide. Herein lies a grave danger, as the degree of heat which is thus generated may rise to the ignition point of acetylene, thereby causing self-ignition and explosion inside of the generator.

As in this class of machine the decomposition of the carbide is secured by a minimum of water, the residuum assumes the consistency of wet earth, or of a semi-solid, and its removal from the apparatus necessitates the opening of the generating chamber to the air, thereby allowing a mixture of air with the gas at each time of re-charging, and thus augmenting the danger of explosion.

It is evident from the foregoing that the dry generator possesses features of hazard which demand its location outside of the building. Then, if an accident occur, the least amount of damage is done. The non-automatic or continuous generator of this system appears to contain features of no less hazard than the automatic, and it should be treated accordingly.

III.—The Advantages of Acetylene Gas.

It is claimed for this gas that it gives the best light known, and the cheapest, and that it is the only light by which all shades of colour can be detected. Both acetylene gas and coal gas have a decided advantage over coal oil, in that the cleaning of all lamps is done away with and the danger of fire greatly decreased.

In the circular of the Savoie-Guay acetylene gas machine, the comparative cost of different illuminants is given as follows:

For Light of 16-Candle Power.

Illuminating gas,	$\frac{3}{4}$ cent.
Electricity,	$\frac{3}{4}$ cent.
Coal oil,	$\frac{3}{4}$ cent.
Acetylene gas,	$\frac{1}{4}$ cent.

And the circular states that acetylene gas, for an equal volume, gives twenty times more light than illuminating gas.

The temperature of an acetylene burner is 900°, while the ordinary gas burner is 1400°. Acetylene therefore heats the air much less.

In addition to this, the gas has no effect on iron or steel, and can in no way be injurious to chandeliers or fixtures.

Pure acetylene will not explode. It is only explosive when mixed with air and if lighted, but as acetylene burners are never more than one-fifth the size of other gas burners, it will take five times as long for acetylene to fill a room if a burner is left open, and therefore, in this respect, it is only one-fifth as dangerous as city gas. On the other hand its explosibility is much greater. Acetylene will not explode in the same manner as gasoline or kerosene, and not being a liquid, it is less liable to the accidents which almost daily occur with these illuminants.

After most careful experiments it has been found that acetylene is not poisonous, and does not change the colour of the blood, as is the case with ordinary gas.

Acetylene gas is clear and colourless. It can be detected at once by its intensely penetrating odour, somewhat resembling garlic.

This strong smell is a great safeguard in its use, as the smallest leakage would be detected at once. Indeed, so pungent is the odour, that it would be practically impossible to go into a room which contained any considerable quantity of the gas.

From acetylene there can be produced all those bodies which we are accustomed to look upon as the most important components of coal gas, but which, up to the present time, have never been produced from anything but coal, hydro-carbon oils, or other organic matter undergoing distillation.

A writer in the *Insurance and Finance Chronicle*, of Montreal, makes the following comparison between acetylene and other illuminants:

"A standard gas burner is one that emits sixteen candle power of light, and to do this consumes five cubic feet an hour of coal gas.

The cost of coal gas is about 25 cents per 1000 cubic feet.

The desirable qualifications of a flame are as follows; viz.,

1. High candle power.
2. Products of combustion few and inoccuous.
3. Temperature of the flame as low as possible.

The desirable qualifications of an illuminating gas are: that it shall —

1. Produce a desirable flame, as outlined above.
2. That it shall be cheaper per candle power of light than any existing illuminating gas.
3. That it can be easily made and transported.
4. That it shall be safe, and not be explosive when mixed with air, nor be poisonous when inhaled into the lungs.

Then does acetylene fulfil these requirements?

Let the facts in the case answer for themselves.

Acetylene gas is a so-called fixed gas; *i.e.* a single gas, while coal gas is a mixture of several gases, viz.: Hydrogen, 50%; methane, 33%; carbon monoxide, 13%; heavy hydro-carbons, 4%; and enriched water gas, as now generally used and delivered by the city gas companies, contains hydrogen, 57%; methane, 23%; carbon monoxide, 19%; heavy hydro-carbons, 14%; nitrogen, 3%; carbon dioxide, 3%; and oxygen, 1%.

As the poisonous constituent of illuminating gas is carbon monoxide, we note that the enriched water gas is more poisonous than ordinary coal gas. Acetylene in this respect is not as dangerous as ordinary coal gas, as it is not poisonous to the same extent, if at all, but it has an unpleasant feature, in that it possesses a disagreeable smell, and nauseating effect upon the human body. This odour is, however, due to impurities resulting from the process of manufacture, as chemically pure acetylene gas has not an unpleasant odour.

It has besides the advantage over coal gas of awaking the sleeper, by upsetting his stomach and inducing vomiting.

Acetylene has about thirteen times the c. p. of coal gas.

It requires a special gas burner, one with a much smaller aperture, and which hence burns less. A correct acetylene gas burner consumes one cubic foot an hour, and yields as much light as three standard coal gas burners burning each eight cubic feet an hour.

Acetylene does not vitiate the atmosphere of a room as much as a coal gas flame, inasmuch as for the same candle power product, acetylene produces two parts of carbon dioxide, while coal gas produces thirteen. Furthermore it consumes less oxygen in this process, and hence vitiates the air less in both respects.

The temperature of the acetylene gas flame is much less than that of the coal gas flame, and it will heat a room much less in consequence.

The gas is not easy to light, and will not as easily produce a fire by leakage, or the promiscuous use of matches, as will coal gas, and the fire risk should not hence be any greater, if as great, although the explosibility is greater, and this may of course cause a fire at the same time."

(The ordinary gas pipes of a building can be used for acetylene gas).

IV. — Its Disadvantages.

The disadvantages of acetylene gas may be briefly summarized as follows:

The intense heat and pressure generated, when a volume of carbide is acted upon by a small supply of water, such heat and pressure tending to the dissociation of the elements of the liberated acetylene and thus producing explosion and ignition.

Its specific gravity or density is 0.91, being only $\frac{8}{100}$ths lighter than the atmosphere, hence it does not readily diffuse, and is liable to stratify in the air and collect in partly enclosed spaces; its density causes it to stratify in a gas-holder when mixed with ordinary coal gas. It is explosive when mixed with air in any proportion from 3% to 82%, the maximum of violence being $8\frac{1}{3}$%, and its explosive energy is very great.

It is liable to the dissociation of its elements at any pressure in excess of one atmosphere, such dissociation promoting explosion. It has been exploded when under two atmospheres' pressure, by a detonating fulminate cap exploded on the casing of the generator.

When produced from impure carbide it is liable to contain gases which will ignite spontaneously upon coming in contact with the air. Acetylene is more explosive than coal gas, inasmuch as less of it with the same amount of air will explode when ignited, and although acetylene under certain conditions can be burned with safety in the household, it is undoubtedly more explosive and less safe than coal gas.

Summary.

The foregoing facts in regard to this gas clearly demonstrate that fire and explosive hazards are inherent in both calcium carbide and acetylene under conditions liable to occur in every day practice, as the machine is now permitted to be installed.

It may here be observed that a number of rulings of Insurance Boards in the United States require the generator located outside of the building, and this is certainly the safer plan. Let the machine be placed where, in event of an explosion, it can

do the least damage, until a few years of experience have brought out more fully the dangers and their preventives as well as the excellencies of the new illuminant.

At the same time, as will be noticed by the permits quoted below, permission is given in New Brunswick and Nova Scotia under certain conditions to locate the apparatus in the building insured.

V.—The Board of Underwriters' Rules Relating to the Installation of Acetylene Gas in New Brunswick and Nova Scotia.

The following regulations have been adopted by the New Brunswick Board of Fire Underwriters. The assured must comply with these requirements when installing the machine, and the machine used must be approved by the Board.

PERMIT FOR USE OF ACETYLENE GAS

(When apparatus is in the building insured or in any building adjoining and communicating therewith.)

Permission is hereby granted for the use of acetylene gas, on the premises described in this policy, said gas being generated by an approved standard machine, called the ——— manufactured by ———

IT IS SPECIALLY WARRANTED BY THE ASSURED

(a) That the apparatus is located in a dry room, without artificial light or fire-heat, and having good ventilation to the outer air nine feet above street level.

(b) That the apparatus shall be maintained in good order, and that the necessary care to ensure its safe and proper working shall always be exercised.

(c) That the generators shall be charged and the refuse removed therefrom by daylight only, and that the refuse shall be deposited outside at a safe distance from the building.

(d) That no carbide shall be kept in the building, except in the generator room, and then only in air-tight metal cases, each case to contain only one charge, and the total quantity to be limited to one week's supply, and in no case to exceed 100 pounds.

The Nova Scotia Board requirements are the same as those for New Brunswick.

PERMIT FOR USE OF ACETYLENE GAS

(When apparatus is NOT in building insured or in any building adjoining and communicating therewith.)

Permission is hereby granted for the use of acetylene gas on the premises described in this policy, the said gas being generated by an approved standard machine, called the ——— manufactured by ——— and located outside either in a non-communicating brick or stone building, with first-class roof, or in a building of other construction detached not less than fifteen feet.

IT IS SPECIALLY WARRANTED BY THE ASSURED that no carbide shall be kept on the premises, except in the generating room, and then only in air-tight metal packages.

In conclusion, and as the latest deliverance on this illuminant with regard to its relation to fire insurance, we append the rules of the New England Insurance Exchange :

ACETYLENE GAS MACHINES.

The use of liquid acetylene or gas generated therefrom is absolutely prohibited.

The permission to generate and use acetylene in insured premises shall be subject to the following rules :

APPARATUS.

It is desirable that all acetylene gas machines shall be installed outside of the building insured, but special permission may be granted in the discretion of tariff associations having jurisdiction to install machines inside the building under special circumstances, such permission to be given in writing and shall be subject to the following rules :

1. Must be made of iron or steel, and in a manner and of material to insure stability and durability.

2. Must have sufficient carbide capacity to supply the full number of burners during the maximum lighting period.

NOTE. — This rule removes the necessity of re-charging at improper hours. Burners almost invariably consume more gas than their rated capacity and carbide is not of staple purity, therefore there should be an assurance of a sufficient quantity to last as long as light is needed. Another important feature is that in some establishments burners are called upon for a much longer period of lighting than in others, which requires a generator of greater gas-producing capacity.

3. Must be uniform and automatically regulated in its action, producing gas only as immediate consumption demands, and so designed that gas is generated without excessive heating at all stages of the process.

NOTE. — This rule is necessary, because the presence of excessive heat tends to change the chemical character of the gas and may even cause its ignition.

4. Apparatus not requiring pressure regulators must be so arranged that the gas pressure cannot exceed thirty tenths inches water column (three inches).

5. Must be provided with an escape pipe which will operate in case of the over-production of gas, and also an attachment acting as an escape or relief in case of abnormal pressure in the machine, and which will carry such excess gas through an escape pipe of at least three-quarter-inch internal diameter to a suitable point outside of building, discharging at least twelve feet above ground level and provided with an approved hood.

NOTE. — Both the above safety vents may be connected with the same escape pipe.

6. Apparatus requiring pressure regulator must be so arranged that the gas pressure cannot exceed three pounds to the square inch. Such apparatus must be provided with additional safety blow-off attachment located between the pressure regulator and the service pipes, and discharging to the outer air, the same as provided for in Rule 5.

NOTE. — This is intended to prevent the possibility of undue pressure of gas in the service pipe by failure of the pressure regulator.

7. Must be so arranged that when being charged the back flow of gas from the holder will be automatically prevented, or so arranged that it is impossible to charge the apparatus without first closing the supply pipe to holder, or to other generating chambers, if any.

NOTE. — This is intended to prevent the dangerous escape of gas.

8. Must be so arranged as to contain the minimum amount of air when first started or re-charged, and no device or attachment facilitating or permitting mixture of air with the gas, prior to consumption, except at the burners, shall be allowed.

NOTE. — Owing to the explosive properties of acetylene mixed with air, machines should be so designed that such mixtures are impossible.

9. No valves or pet cocks opening into the room from gas-holding part or parts, the draining of which will allow an escape of gas, shall be permitted; and the condensation from all parts of the apparatus must be automatically removed without the use of valves or mechanical working parts.

NOTE. — Such valves and pet cocks are not essential; their presence increases the possibility of leakage. The automatic removal of condensation from the apparatus is essential to the safe working of the machine.

10. The water supply to generator must be so arranged that gas will be generated long enough in advance of the exhaustion of the supply

already in the gas-holder to allow of the using of all lights without exhausting such supply.

NOTE. — This provides for the continuous working of the apparatus under all conditions of water feed and carbide charge, and it obviates the extinction of lights through intermittent action of the machine.

11. No carbide chamber of over twenty-five pounds capacity shall be allowed in any machine where water is introduced in small quantities, or where the contact of water with carbide is intermittent.

NOTE. — This tends to reduce the danger of overheating, and provides for the division of the carbide charges in machines of these types of large capacity.

12. Generator must be connected with the gas-holder in such manner that it will, at all times, give open connection either to the gas-holder or to the blow-off pipe into the outer air.

NOTE. — This prevents dangerous pressure within, or the escape of gas from generating chamber.

13. Must be so designed that the residuum will not clog or affect the working of the machine, and can conveniently be handled and removed.

14. Covers to generators must be provided with secure fastenings to hold them properly in place, and those relying on a water seal must be submerged in at least twelve inches of water. Water seal chambers for covers depending on a water seal must be one and one-half inches wide, and fifteen inches deep, excepting those depending upon the filling of the seal chambers for the generation of gas, where nine inches will be sufficient.

15. Holder must be of sufficient capacity to contain all gas generated after all lights have been extinguished.

NOTE. — If the holder is too small and blows off frequently after lights are extinguished there is a waste of gas. This may suggest improper working of the apparatus and encourage tampering.

16. The bell portion must be provided with a substantial guide to its upward movement, centre guide preferred, and a stop acting about one inch above the blow-off point.

NOTE. — This tends to insure the proper action of the bell, and decreases the liability of escaping gas.

17. A space of at least three-quarters of an inch must be allowed between the sides of the tank and the bell.

18. All water seals must be so arranged that the water level may be readily seen and maintained.

19. Gas-holders constructed upon the gasometer principle must be so arranged that when the gas bell is filled to its maximum its lip or lower edge shall at all times be submerged in at least nine inches of water.

20. The supply of water to the generator for generating purposes shall not be taken from the water seal of any gas-holder constructed on the gasometer principle.

NOTE. — This provides for the retention of the proper level of water in the generator.

21. The apparatus shall be capable of withstanding fire from outside causes without falling apart or allowing the escape of gas in volume.

NOTE. — This prevents the use of joints in the apparatus relying entirely upon solder.

22. Gauge glasses, the breakage of which would allow escape of gas, shall not be permitted.

23. Where purifiers are installed, they must conform to the general rules for the construction of other apparatus and allow the free passage of gas.

24. The use of mercury seals is prohibited.

NOTE. — Mercury has been found unreliable as a seal in acetylene apparatus.

25. Construction must be such that liquid seals shall not become thickened by the deposit of lime or other foreign matter.

26. Apparatus must be constructed so that accidental syphoning of the water is impossible.

27. Flexible tubing, swing joints, packed unions, springs, chains, pulleys, stuffing boxes, and lead or fusible piping must not be used on apparatus, except where the failure of the part will not vitally affect the working or the safety of the machine.

28. There shall be plainly marked on each machine the maximum number of lights it is designed to supply and the amount of carbide necessary for a single charge.

To be approved, acetylene generators must conform to the foregoing standard, and plans and specifications in detail of such apparatus must be submitted to the insurance organization having jurisdiction over the territory in which such apparatus is to be installed, for approval by an inspector duly authorized by the ——— Association, with whom a copy of such plans and specifications must be filed. If the plans are approved, a special examination of the generating apparatus will be made at the expense of the applicant, and if it is found to be in compliance with the standard, a certificate of approval will be issued.

CALCIUM CARBIDE.

1. In no case shall calcium carbide be stored in bulk.

2. Calcium carbide must be packed in screwed-top, water-tight metal packages, having all seams lock-jointed and soldered. They shall contain not over one hundred and twenty-five pounds of carbide, and

each package must be conspicuously marked *Calcium Carbide, Keep Dry.* The packages must be of sufficient strength to insure the handling of the same without rupture, and they must be kept under cover at all times.

INDORSEMENT FOR USE OF ACETYLENE GAS.

In consideration of the following warranties on the part of the assured, permission is hereby granted to generate and use acetylene gas on the premises described in this policy, using a ——— acetylene gas machine, manufactured by ——— at ——— when the same is installed in accordance with the rules and regulations of the National Board of Fire Underwriters, and adopted and promulgated by the ——— Association.

Warranted.

That the generator shall be charged, and calcium carbide handled by daylight only;

That no direct fireheat or artificial light shall be allowed in the room containing the apparatus;

That no calcium carbide shall be kept in the building where this policy covers;

That no greater number of lights shall be installed than the maximum for which the machine is rated;

That no change shall be made in the installation without the written consent of this company indorsed hereon.

The use of liquid acetylene or gas generated therefrom, on the premises described herein, is absolutely prohibited.

CAUTION.

Calcium carbide should be kept in water-tight metal cans, by itself, outside of any insured building, under lock and key and where it is *not* exposed to the weather.

A regular time should be set aside for attending to and charging the apparatus during *daylight* hours only.

In charging generating chambers clean all residuum carefully from the containers and remove it at once from the building. Separate the unexhausted carbide, if any, from the mass and return it to the container, adding new carbide as required. Be careful never to fill container *over* half full, as it is important to allow for the swelling of carbide when it comes in contact with the water.

Never place carbide into the containers until all residuum has been carefully removed.

Water tanks and water seals must always be kept filled with clean water.

Where apparatus is not intended for use throughout the year, all water must be removed at the end of season.

Never use a lighted match, lamp, candle, or any open light near the machine.

KEROSENE AND OTHER OILS.

Kerosene, according to Hine's Instruction Book on fire insurance, is the prominent incendiary of the present hour.

There are statistics or tables, made up in the States, and known as the "Chronicle Fire Tables," prepared from reports of thousands and thousands of fires: these all being classified, according to the different risks, and the percentage of each cause for each different risk given: and from these tables, we find that in dwellings and tenements, lamp accidents and explosions are responsible for 13½% of the numerous fires reported; in retail groceries, nearly 25%; in hardware stores, 10%; and country and general merchandise stores, 19%.

It is evident, therefore, that there must be an element of great hazard about kerosene oil, to cause this large percentage of fires. And we find that the special hazard of kerosene is this: Kerosene, coal oil, or earth oil, no matter how pure, when exposed to heat, from fire or the rays of the sun, exhales a certain amount of a light carbonated-hydrogen gas, and this gas is very explosive. Any agitation or shaking of the vessel containing these oils, or motion of the oil itself, as when running, will generate this gas in quantities.

It will exhale even when undisturbed; the dropping of a lamp near a leaky barrel of coal oil, has been known to cause an explosion of this gas. It is indeed a notorious fact that numerous accidents, by explosion, have occurred from drawing kerosene and its products in the vicinity of open lights.

This gas accounts for the explosion of lamps, filled while they are burning, or when but half full of oil; the vacancy above the oil being filled with gas, generated by the heat of the flame.

A certain proportion of the danger is taken away, if oil of a proper standard be used. In the United States no kerosene oil is allowed to be sold which flashes under 110°.

By the flashing test we mean the following: and this test can be tried in any building where oil is kept for illuminating purposes. Place a few spoonfuls of the oil to be tested in a tin dish, and float the dish on a vessel of warm water. Heat the

water slowly and put a thermometer in it. As the temperature of the water rises, hold a lighted match over the oil, and note the thermometer when the vapour from the oil begins to flash and burn around the match. If it flashes below 100°, or burns below 120°, the oil is poor and should be refused unconditionally.

Some of the dangerous practices prevailing among people who do not know the nature of kerosene or its explosibility, are the following; viz.,

Filling lamps when lighted.

Putting kerosene on kindling wood to start fires, or to hasten a slow fire. (It is stated that one woman per day is sacrificed by this practice, to say nothing of the insurance loss.)

Blowing out lamps without turning them down low, or blowing down the chimney to put them out. This often results in sending the flame down into the vapour beneath.

Cleaning and filling lamps at night.

Leaving oil where it can be reached and upset by children, or wasted, and worse than wasted by careless servants.

Drawing oil by artificial light.

We believe that if the following cautions are observed the mortality and the fire loss from this source can be materially reduced:

1. Never use poor oil, or oil below a flashing point of 110°.
2. Clean and fill lamps by daylight only.
3. Never allow oil to be used for making or helping fires.
4. Never fill lamps while burning.
5. If necessary to fill a lamp by artificial light, place the light at least ten feet away from the lamp being filled.
6. Keep the oil away from children and careless servants.
7. If a lamp rests on a bracket, or hangs below woodwork, see that there is at least thirty inches clear space above the chimney.

In England there is, up to the present (1899), no law regulating the sale of kerosene oil below a certain flashing test. And it is stated that two hundred people yearly are burnt to death by the low grade oil that is used.

As a consequence of the absence of legislation on this important subject the Standard Oil Company have manufactured and shipped to England for sale, a grade of oil with a flash test of about 73°, and which they could not sell in the United States. A law is now under consideration, however, to make the test 100°, but even this is almost too low.

In coal oil, or kerosene stoves, many improvements have been made, which reduce their danger to that of an overgrown kerosene lamp with two or more large wicks, unprotected by a chimney. To say that they are without danger is to take a very superficial view of the matter; but they are so much safer than gasoline, which was formerly used, that insurance companies regard them with favour, in consideration of their hazardous predecessors.

There are other liquids used for producing gas known as gasoline, naptha, benzine, liquid gas, auroral oil, and by various other names. They are, without exception, highly volatile, and of necessity inflammable, producing explosive vapour, and therefore extremely dangerous. If they were not they would not make gas.

In no circumstances should these liquids be stored or handled in or near premises that are insured. In no case should a receptacle or reservoir of gasoline be permitted in insured premises, whether in connection with a gas machine or otherwise.

NEW ENGLAND INSURANCE EXCHANGE.

MEMBERS' CIRCULAR, SERIES XVIII, No. 2.

"The danger from gasoline and other highly inflammable oils, is not so much in the lamps or other devices for which they may be used, as in these oils being on the premises.

At ordinary temperatures, gasoline continually gives off an inflammable vapour, and a light some distance from it will ignite through the medium of this vapour.

It is said that one pint of gasoline will impregnate 200 cubic feet of air and make it explosive, and it depends upon the proportions of air and vapour whether it becomes a burning gas or a destructive explosive.

The special cautions given in regard to gasoline are:

Beware of any leaks in cans.

Remember always the dangerous character of this oil.

Never attempt to fill the reservoir of a lamp while the lamp is burning, or if any light is in the room.

Carelessness may hazard life as well as property."

Griswold says: "Many fires are doubtless caused by a violation, not only of police regulations of cities relative thereto, but of the plainest principles governing the storing or use of such articles as coal oil, naphtha, benzine, gasoline, benzole, nitro-glycerine, and other similar combustible and explosive substances. The constant handling of and familiarity with these dangerous materials, engendering a feeling of false security and temerity, and consequent carelessness, from the results of which the community is the sufferer."

ELECTRICITY.

It is not our intention to go deeply into this subject, for its extent seems to be unlimited.

What we are now going to set down is rather designed as introductory to a further study of this modern force.

We shall try, however, to explain the first principles, and also tc furnish some ordinary cautions as to electric wiring, lighting and power.

There is danger in electricity and many fires have been caused by the subtle current. The percentage varies according to the risk, and runs from 1% to 13% in different classes of hazards.

It has been proved by experiments that incandescent lamps in contact with inflammable material will start fires, and also that old lamps are more apt to do this than new ones.

The Universal Rating Schedule of the United States adds 25 cents or ¼% to the rate, if the electric lighting and wiring are not in compliance with the strict board rules applying to this means of illumination. So the advantage of good wiring is obvious.

If properly installed, no system of lighting is as safe as electricity, but if the wiring is improperly done, fire is almost sure to result.

Electricity then, as almost every school child knows, is generated by the chemical action of two dissimilar metals, immersed in a mixture of water and sulphuric acid.

But while a knowledge of the principles of the battery and galvanic currents appears to be quite general, the principles of electro-magnetic or dynamic electricity are not so well understood.

This latter method is employed almost exclusively for electric lighting and power, and is to a considerable extent supplanting the battery for telegraphic purposes.

We will therefore first try and give a brief explanation of the laws of magnetism and the principles of generating dynamo-electric currents.

Magnetism.

Magnets are of two classes. First, permanent magnets, which are sub-divided into two classes; viz., the steel magnet (the horseshoe magnet is a familiar type of this), and the lode-stone or magnetic ore; second, electro magnets, consisting of a spool or spools of insulated wire usually bound on a core of soft iron. The field magnets of dynamos and electric motors, the spool magnets of telegraph, telephone and electric bells are familiar types of electro magnets.

A piece of steel brought under the influence of or in contact with a magnet becomes permanently magnetized, hence the term permanent magnet.

The soft iron core of the electro magnet becomes magnetic the moment a current of electricity is passed through the coil surrounding it, and instantly loses its power the moment the current ceases to flow.

Now all types of magnets, including conductors carrying electrical currents, are enveloped by a magnetic field, or as it is sometimes called "magnetic atmosphere." This is the "field" of the dynamo, and this field exhibits well defined lines known as magnetic lines of force — these lines flowing in a curve or swirl from the + (positive) to the — (negative) poles.

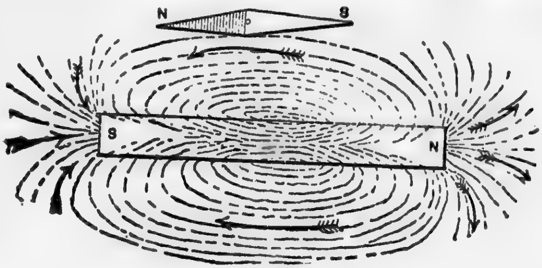

FIG. 1 — MAGNETISM.

THE MANNER IN WHICH ELECTRIC CURRENTS ARE GENERATED BY MAGNETISM.

If a spool of insulated wire, having its terminals connected together, be passed near the pole of a magnet, so as to cut through its lines of force, an electric impulse, or in other words an electric current of momentary duration will be induced in the spool of wire. If the spool be made to cut the lines of force at the rate of 1000 times per second, 1000 electric impulses per second will be induced in the spool of wire. This then is the fundamental principle upon which all dynamo electric generators are designed.

We now naturally come to the dynamo, the great generator of this modern force. The dynamo is the machine in which the coils of wire are rapidly revolved in the magnetic field of powerful magnets, thus causing currents to be induced in the coils of wire.

Our space will not permit of a very extended description of the dynamo, but the following brief outline of its constructive details will be found useful. A mass of soft iron (shape immaterial) is wound with many turns of insulated copper wire in such a manner that were an electric current sent along the wire the mass of iron would become strongly north at one extremity and south at the other. As prolongations of the electric magnet thus produced are affixed two masses of iron facing one another,

and so fashioned or bored out as to allow a ring or cylinder of soft iron to rotate between them. This cylinder or ring of iron is also wound with insulated wire, two or more ends of which are brought out in a line with the spindle on which it rotates, and fastened down to as many insulated sections of brass cylinder placed around the circumference of the spindle. Two metallic springs connected to binding screws, which form the "terminals" of the machine, serve to collect the electrical wave set up by the rotation of the coiled cylinder (or "armature") before the poles of the electro magnet. The cut will give a clear idea of the essential portions of a dynamo:

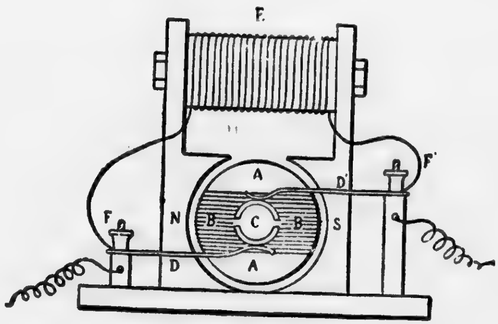

FIG. 2—DYNAMO.

E is the mass of wrought iron wound with insulated wire and known as the field magnet. N and S are cast iron prolongations of the same and are usually bolted to the field magnet; when current is passing, these become powerfully magnetic. A is the rotating iron ring or cylinder, known as the armature, which is also wound with insulated wire B, the ends of which are brought out and connected to the insulated brass segments, known as the commutator C. Upon this commutator press the two springs D and D′, known as the brushes, which serve to collect the electricity set up by the rotation of the armature.

These brushes are in electrical connection with the two terminals of the machine F F′, whence the electric current is transmitted where required; the terminals being also connected with the wire encircling the field magnet E. Now on causing the armature to rotate, by connecting up the pulley at the back of the shaft (not shown in cut) with any source of power, a very small current is set up in the wires of the armature, due to the weak magnetism of the iron mass of the field magnet. As this current, or a portion of it, is caused to circulate around this iron mass through the coils of the wire surrounding the field magnet, this latter becomes more powerfully magnetic, and being more magnetically active sets up a more powerful electrical disturbance in the armature. This increased electrical activity in the armature increases the magnetism of this field magnet, as before, and this again re-acts on the armature; and these cumulative effects rapidly increase until a limit is reached, dependent partly on the speed of rotation, partly on the magnetic saturation of the iron of which the dynamo is built up, and partly on the amount of resistance in the circuit.

If too much current is generated by the dynamo there is, of course, the danger of the wires heating and burning off their insulation, with consequent fire danger. The floor around a dynamo is usually, more or less, covered with oil and the burning insulation of the wires dropping on this might start a fire. This is the danger of running a dynamo over-load, as it is called, and should be guarded against.

The Electric Motor.

In the electric motor we have the converse of the dynamo, in other words a dynamo, driven by a steam engine or other power, is a converter of mechanical force into electrical energy. If the steam be shut off from the engine and a current of electricity from another source be sent through the armature of the dynamo the latter becomes a motor and will in turn drive the engine or any other machinery bolted to it. The dynamo then, as a motor, becomes a converter of electrical into mechanical energy.

We have seen that the armature of a dynamo, or motor, is made up of a number of coils or loops of wire wound parallel to its shaft. We have also learned that conductors, when carrying currents, are enveloped by a magnetic field or swirl. We have also shown that the magnetic lines of force pass from the north to the south pole of magnets, and consequently in a dynamo or motor they would pass through the armature which is located between the poles. Suppose then we send a current through one loop of the armature. As we have already explained this loop would be enveloped by magnetic lines of force as soon as the current goes through it. These lines of force are repelled by the lines of force passing between the north and south poles of the magnet, and this has the effect of forcing the loop out of the field and consequently causing the armature to turn. This partial turning of the armature has caused the commutator terminals of this particular loop to break contact with the brushes, cutting off the supply of current to the loop making it inoperative at the instant the commutator terminals leave the brushes. A second pair of terminals then come in contact, its loop is acted upon as described, and the rotative action of the armature receives another impulse and so on.

In practice the armature is made up of a large number of these loops which are so connected with the commutator bars as to form one continuous coil.

This is the fundamental principle of the motor.

Volts, Amperes, and Ohms.

As the foot, pound, minute, and gallon serve as arbitrary units of measure, of work, of time, and of substance, so do the volt, ampere, ohm, and watt serve as arbitrary units of measure of electrical pressure, quantity, resistance, and work or power.

Here we may enunciate a few principles. Water naturally flows from a higher to a lower level. This difference of level we call head. The greater the difference between two levels the greater will be the head or pressure and the greater the rate or

velocity of the flow. In other words the rate of flow through a pipe will increase as we increase the head or pressure of the source of supply.

We know too that the pressure of water or gas is reduced by the friction caused by passing through the pipes, but the pipe does not absorb any portion of the gas or water. So if friction causes loss the loss suffered must be in work or pressure exerted in forcing the gas and water through the pipes. The longer the pipe the greater will be the friction or resistance and the greater the loss in pressure and consequent reduction in rate of flow. It is then clear that if we wish to lengthen a gas or water main, and still keep the rate of flow at its normal state, one or two alternatives must be adopted; viz., an increase of pressure, or a larger size of pipe.

Therefore as a difference of level or head is required to cause a flow of water so do we require a difference of electrical potential or pressure to cause a flow of electric currents, and as water is retarded by the resistance of the pipes so is the flow of electricity by the resistance of the conductor or wire through which it passes.

We may carry this analogy between water and electricity still further. As in a water service, the longer the pipe the greater the pressure required, so in electric wiring, the longer the wire and the further the current has to travel the greater the pressure needed to drive a certain current through it and the greater will be the resistance. Again: in a water service the smaller the pipe the greater the resistance and the smaller the flow, so in electric wires the smaller the size of the wire the greater the resistance and the less current it will carry without dangerous heating. For we may say here and it must be remembered that if it is attempted to send a heavy current of electricity over a small wire, the resistance offered by the wire and the friction of the current passing through it would cause the wire to heat, burning off the insulation and thus starting a fire. So in electricity the smaller the wire the greater the resistance and the less current it will carry safely. Or as the same principle is laid down in Ohm's law: The resistance of a wire is exactly proportioned to its length when its diameter remains constant.

Again: the resistance of a wire of a given length increases as its sectional area, or diameter, or weight per foot decreases, and its resistance decreases in an inverse ratio as its sectional area is increased. If we double the length of wire of a given diameter we double the resistance. Therefore the quantity of current passing through a wire is governed by the resistance of the wire, and the electro motive force (abbreviated to E. M. F.) or pressure (equivalent to head of water) under which the current is flowing.

The unit of electro motive force or pressure is called a volt. The unit of current strength or quantity is called an ampere, and the unit of resistance is called an ohm.

Now the relation of these three to each other is this: The volt is the pressure that will deliver one ampere of current through one ohm of resistance. Similarly the ampere is the amount of current that one volt will force through one ohm of resistance. And the ohm is the unit of resistance which will limit the amount of current passing through it to one ampere at a pressure of one volt.

Ohm's law then, upon which the foregoing units are based, is that the current in amperes is equal to the E. M. F. or pressure in volts divided by the resistance of the circuit in ohms, or as it is expressed by the equation $c = \frac{e}{r}$.

c = current in amperes.
e = E. M. F. in volts.
r = resistance of the circuit in ohms.

Therefore, $r = \frac{e}{c}$, and $e = c \times r$.

For the purpose of making this perfectly clear we may refer again to the analogy between a water service and electricity. The terms can be explained thus: The volt in electricity equals the pressure of a water service; the ampere equals the strength or flow of the current, and the ohm equals the resistance of the pipes.

We will now apply Ohm's law so that we may see how it works out in practice.

The Edison incandescent current can be estimated about as follows: On the 110 volt system a 16 candle power lamp will take $\frac{1}{2}$ ampere. On the 52 volt system a 16 candle power lamp requires 1 ampere. This can be readily understood in this way: If we have a volume of water doing a certain amount of work at a pressure of 50 lbs. and we cut down the pressure to 25 lbs. it will take twice as much volume or flow of water to do the same amount of work.

Suppose then we take an ordinary incandescent lamp which we find is marked 110 volts and 16 candle power, by which we understand that 110 volts pressure is necessary to force sufficient current through the lamp filament to bring it up to 16 candle power. We also find by indicator measurement that the lamp requires one-half, or to be exact .45 of an ampere of current. The formula for the resistance is

$$r = \frac{e}{c} \therefore r = \frac{110}{.45} = 244.4 \text{ ohms}$$

as the resistance of the lamp, not in this case the resistance of the circuit.

Or again; suppose we have a circuit, the resistance of which we know to be 8 ohms, and wish to deliver 25 amperes of current through it.

What pressure or E. M. F. is required?

$$e = c \times r \therefore e = 8 \times 25 = 200 \text{ volts.}$$

That is to say a pressure of 200 volts is required to drive a current of 25 amperes through a conductor of 8 ohms resistance. Should the circuit be reduced one-half in length, or the conductor doubled in weight, its resistance would be reduced one-half, in which case only 100 volts would be necessary to obtain 25 amperes of current.

Electrical Horse Power.

A mechanical horse power = 33,000 lbs. raised to a height of 1 foot in a minute. The electrical unit of power, not pressure, is called a watt and = $\frac{1}{746}$ of a horse power, or 44.3 foot lbs.

per minute. A watt is a volt-ampere, that is a volt × by an ampere. For example: one 110 volt lamp × by the current .45 of an ampere = 49.5 watts. Then, as we have seen 746 watts = one horse power, one horse power would supply 15 lamps of 16 candle power @ 110 volts. That is $\frac{746}{49.5} = 15$.

Or if we purchase a dynamo, which we find is rated at 110 volts and 400 amperes = 44,000 watts, which taking the above example of 16 candle power lamps and .45 of an ampere current for each and dividing 44,000 by 49.5 we find that a dynamo of this capacity would supply 888 lamps of 16 candle power. Now 44,000 watts divided by 746 watts (1 horse power) = 58.98 electrical horse power of the dynamo.

But as it is impossible to convert one form of power into another, as mechanical force into electrical energy, without loss, the actual horse power developed to supply the 44,000 watts, would be the 58.98 electrical horse power + the losses in the dynamo and engine, due to friction and conversion. Estimating the fraction of loss at 20% the mechanical or indicated horse power required for the above would be 58.98 + 20%, or 70.77 horse power.

By indicated horse power is meant the indicated horse power developed in the cylinder of the engine, which is the point from which we must figure the cost of power.

The 11.79 horse power represents the loss of power in overcoming friction and the conversion of mechanical force into electrical energy.

Electrical Heat.

The question may naturally be asked: If the electric current raises the filament of an incandescent lamp to a white heat, sets the kettle boiling on the electric stove, heats polishing, and soldering irons, and other electrical heating devices, why does it not heat the conducting wires through which the current is supplied, and thus disintegrate the insulation?

In answer to this we first define our terms.

Electric heat is simply an effect produced by excessive friction between the electric current and its conducting wire. In overcoming the resistance of an electrical conductor we suffer a loss of electric energy, and this loss is converted into heat; the amount depending upon the degree of friction or resistance. If the conductor is large enough to carry a given amount of current with practically no loss the resistance of the wire is relatively nothing and no heat is evolved, or if there is a slight heating it will be dissipated as rapidly as it is developed. If we increase the amount of current to the extent of taxing the capacity of the wire the resistance of the wire becomes relatively too high, and the energy used in overcoming this resistance is converted into heat. The more the conductor is taxed the greater the loss of energy and consequent increase in heat.

This then is an important point for insurance men and inspectors to examine closely; viz., that the wire used is of the proper size for the current it is carrying. Many fires have been caused by the overheating of the electric wires. But we will take this up further on.

In the case of the incandescent lamp the current goes through a conductor proportioned to its strength. It enters the filament of the lamp and the resistance becomes greater, as the filament is smaller than the wire. This resistance raises the wire to a white heat. Similarly if a sudden overcharge of current strikes any conductor it will raise its temperature. Wires have been known to become red, or even white hot, burning their insulating covering away and setting fire to everything combustible with which they came in contact. Three or four fires took place at the electrical exhibition at Paris, in 1871, from this cause. To continue: We know that the current passes through the wires going out from the north pole and returning to the south pole, and as it returns it cannot be consumed. It is only the E. M. F. or pressure that is consumed in forcing the electric current through the resistance of the lamps and conductors.

Electrical Distribution.

We will now assume we have a dynamo, designed to generate a current of 50 amperes, which will supply about 100 lamps of 16 candle power each, and we wish to supply current for 20 lamps requiring 10 amperes. The lamps are connected between two conducting wires and these conducting wires are not connected at their extremities. Hence, if all the lamps are turned off, our circuit is incomplete, and there will be no current on the mains. When we turn on a lamp we connect the two main wires through the filament of the lamp; this, of course, completes the circuit, and just sufficient current will now flow over the mains to supply that one lamp. If we turn on a second lamp we have two paths for the current and twice the amount of current will be automatically supplied, and so on.

Returning to our problem, we select a wire of just sufficient size or capacity to carry the 10 amperes at a small percentage of loss. This small percentage of loss of electrical energy is converted into heat in the wire and is, we will assume, just sufficient to raise the temperature of the wire a few degrees above that of the surrounding air. If under these conditions we double the number of lamps the loss of energy, due to crowding the conductor, will be practically doubled and the temperature of the wire will be greatly increased. The reason of this is that for every lamp that is added one-half an ampere more of current comes on the main wire. So that if with 20 lamps we have a current of 10 amperes, with 40 lamps, or double the number, we would be sending a current of 20 amperes through a wire, which, as we stated above, would only take 10 amperes. The wire, therefore, being too small to carry the current causes a high resistance which heats the wires to red or even white heat, with the consequent imminent danger of fire. We may continue to add lamps until the loss of energy in the conductors exceeds the energy used by the lamps. When this condition is reached the resistance of the combined lamps will be less than that of the conductors and their combined current capacity will exceed that of the

conductors while the temperature of the latter will exceed that of the lamps; and the result will be a call on the insurance companies to make good the damage. Hence the conducting wires must always have a capacity considerably in excess of that of the combined devices which the mains are to supply with current.

Electric Transmission.

In transmitting electricity we are transmitting watts of electric power; that is volts × amperes = watts.

We transmit to a motor 100 volts × 100 amperes = 10,000 watts, or 1,000 volts × 10 amperes = 10,000 watts, and as the size of the wire is determined by the number of amperes it has to carry it is clear that the motor run at 1,000 volts and taking but 10 amperes would require a service wire but one-tenth as large as that required for the 100 volt motor.

The higher the pressure the more dangerous is the current, and therefore Edison, when he designed his incandescent light system for interior illumination, realizing that the lamps, switches and other devices would be placed within the reach of children and domestics, fixed upon a pressure which experiment and experience had demonstrated to be absolutely harmless to the human system. This low pressure system of distribution requires the use of heavy copper conductors and is practically limited to a radius of one and one-half to two miles from the power house. The reason of this is that the heavy wires used would make it very expensive and principally that the low pressure (110 volts) is not sufficient to drive the current through the high resistance of a long circuit. The application of this system, therefore, to the lighting of the streets and suburbs of a large city would be commercially prohibitive.

In electric railway work, where the motors and currents are placed beyond the reach of the public, a pressure of 500 volts is employed. This is a most disagreeable pressure to handle but not fatal to human life through any possible accidental contact.

No doubt the reader will recall one or more instances of horses having been killed by railway 500 volt currents, but this is explained by the fact that the resistance of the horse's body with its four iron shod feet and any portion of its body which may come in contact with the wire is so much lower than the human body that 500 volts pressure is sufficient to drive the necessary quantity of current through the horse's body to produce fatal results. Suppose the resistance of the human body to be 10,000 ohms and that of the horse but 1,000 ohms; the latter, according to Ohm's law, will receive ten times as many amperes, the voltage in both cases being equal. Amperes or quantity of current is necessary to kill, but when the current lacks sufficient pressure to force the necessary quantity through the resistance of the body it cannot be fatal.

When it is necessary to distribute electric currents over distances of ten, fifteen and twenty miles, as in lighting streets with arc lamps, pressures of from 5,000 to 6,000 volts are employed. These high pressures are deadly and their use is only admissible when placed beyond the public reach and under the control of expert electricians. The system particularly referred to is known as the series or high tension arc lighting system. In this system the lamps are connected in series along the circuit, that is the amperes have to pass through one before they reach the next, and this system differs from the incandescent system referred to before, where the lamps are connected in multiple and each lamp forms an independent path for the current; in that, in the arc system, the amperes remain constant, independent of the number of lamps, the voltage varying as the number of lamps in series; while in the other the pressure or voltage remains constant, the amperes varying with the number of lamps connected.

The dynamo for this arc light system is designed to generate a constant current of 10 amperes, and is capable of automatically generating a pressure equal to that required by the number of lamps in circuit. Each arc lamp of 2,000 candle power requires about 10 amperes and 50 volts. As the dynamo can only generate a current of 10 amperes it is clear that the current must be

forced successively through each lamp in the series. It is also plain that if each lamp requires a pressure of 50 volts the dynamo will have to generate 100 volts to force the 10 amperes through the second lamp, 150 volts for the third, and 500 volts to force the 10 amperes through the tenth lamp. If we have a circuit of 50 lamps the dynamo would then require to generate a current of 10 amperes at a pressure of 2,500 volts.

List of Conductors and Insulators.

The following is a list of bodies in their order of conductivity. Those at the top of the list, the metals especially, offer very little resistance to the passage of electricity and are therefore called conductors. As we descend the list the bodies increase in resistance, becoming worse conductors and better insulators. Those at the bottom offer extremely great resistance to the flow of electricity and are therefore called insulators.

Good conductors: Metals.

Fair conductors.
- Charcoal and coke.
- Carbon.
- Plumbago.
- Acid solutions.
- Sea water.
- Saline solutions.
- Metallic ores.
- Living vegetable substances.
- Moist earth.

Semi-conductors.
- Water.
- The body.
- Flame.
- Linen.
- Cotton.
- Dry Wood.
- Marble.

Insulators.

1. Slate.	8. Gutta percha.	14. Resins.
2. Oils.	9. Ebonite.	15. Amber.
3. Porcelain.	10. Mica.	16. Paraffine wax.
4. Dry leather.	11. Jet.	17. Shellac.
5. Dry paper.	12. Sealing wax.	18. Glass.
6. Silk.	13. Sulphur.	19. Dry air.
7. India rubber.		

We will now give a short definition and explanation of the various terms, instruments and devices used in electricity and electric wiring. We have also included a few instructions and regulations relating to some of the more important devices.

No. 1 Ampere.

The unit of current strength or volume of flow. It is the flow of electricity produced by the pressure of one volt at a resistance of one ohm. A volt divided by an ohm = an ampere.

Arc and Arcing.

An arc is the stream of hot gases and particles of carbon visible between the carbons of an arc lamp. There are other arcs, however, formed as follows: When the flow of electricity reaches the end of a wire, and if the connecting point is but a short distance away, the current will seek to jump the intervening space. This can be seen at any time in a power station when a heavy current is disconnected by a circuit breaker or hand switch. As the connections are pulled out there will be a spark of flame and a snap as the circuit is broken, and if the break were made slowly, instead of sharply, the arc would be of much greater length. Arcing then is dangerous, from a fire standpoint, if there be any inflammable material in the vicinity. For this reason the insurance rules call for all apparatus in which an arc may occur in its working to be enclosed in a non-combustible case or supported on bases of non-combustible, non-absorptive insulating material.

Armature.

An armature in a dynamo consists of a number of coils or loops of wire in which the electric currents are induced when the armature is rotated between the poles of the dynamo. The armature cuts the lines of magnetic force, produced by the north and south poles of the magnets, and this cutting induces a current in the coils of the armature.

Brushes.

The brush is a collection of metal sheets or wires which press against the commutator of a dynamo to collect the electricity, or of a motor to supply it with current. Carbon brushes are coming into use now, especially in railroad work.

Circuit.

A system of conductors through which electricity passes.

Commutator.

That part of a dynamo which collects the current from the armature and transfers it to the brushes. From the brushes the current is led off to the external circuit.

Conduit.

The object of a tube or conduit is to facilitate the insertion or extraction of the conductors, to protect them from mechanical injury and as far as possible from moisture. Tubes or conduits are to be considered merely as raceways, and are not to be relied on for insulation between wire and wire or between the wire and the ground.

Current.

The flow of electricity in a conductor, analogous to the flow of water in a pipe. A continuous current is one that does not change its direction, while an alternating current is one that periodically reverses.

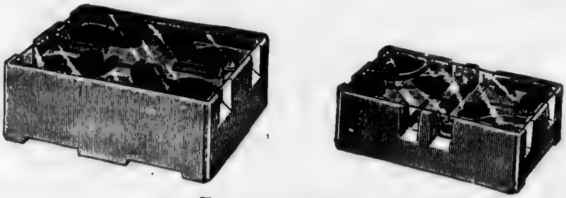

FIG. 3 — CUT OUTS.

CUT OUTS; VIZ., CIRCUIT BREAKERS AND FUSES.

These are devices known as circuit breakers and fuses. A circuit breaker is a connection made in the wire so that the circuit can be broken, automatically or otherwise. The automatic circuit breaker is gauged to break connection at a certain pressure. The fuses are little pieces of lead which are graded to melt at a certain heat, thus destroying the circuit. For instance, if we take a wire, the safe carrying capacity of which is ten amperes, and we place in it a fuse which will melt at the heat caused by passing twelve amperes through it, we allow a little over the safe carrying capacity of the main wire so that the fuse will not blow or melt for mere light fluctuations of the current. If now any heavy current wire gets afoul of our fused wire, forming a short circuit, the heavy current will melt the fuse and break the circuit. These fuses are the best possible protection against too heavy a current, and they are therefore located on the wires immediately after they enter the building. The safest way is to have one on each wire, or a double pole fuse as it is called.

These automatic cut outs, such as circuit breakers and fuses, should be placed on all service wires as near as possible to the point where they enter the building on the inside of the walls, and arranged to cut off the entire current from the building. The cut out or circuit breaker should always be the first thing that the service wires are connected to after entering the building, the switch next and the other fixtures or devices in their order. This arrangement is made so that the cut out or circuit breaker will protect all wiring in the building, and the opening

of the switch will disconnect all the wiring. Automatic cut outs should not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases, or dust, or to flyings of combustible material, as the arcing produced when they break the circuit might cause a fire or explosion. Where they are exposed to dampness they should be enclosed in a waterproof box or mounted on porcelain knobs. All cut outs and circuit breakers should be supported on bases of non-combustible, non-absorptive insulating material. Cut outs should be provided with covers, when not arranged in approved cabinets, so as to obviate any danger of the melted fuse metal coming in contact with any ignitable substance. All cut outs and circuit breakers should be plainly marked, where it will always be visible, with the name of the maker and the current and voltage for which the device is designed. Cut outs or circuit breakers should be placed at every point where a change is made in the size of the wire, unless such a device in the larger wire will protect the smaller. They should never be placed in canopies or shells of fixtures, but should be so placed that no set of incandescent lamps, whether grouped on one fixture or several fixtures or pendants requiring a current of more than six amperes, should be dependent upon one cut out.

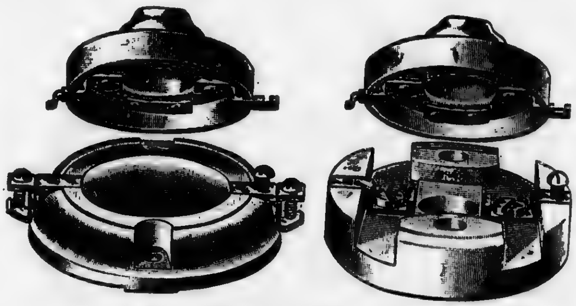

FIG. 4 — ROSETTES.

Fused rosettes, when used with flexible cord pendants, are considered as equal to a cut out.

Fused rosettes are the round porcelain devices from which incandescent lights are hung. A reference to the cut will illustrate their working.

Fuses.

Fuses for cut outs should not have a capacity to exceed the carrying capacity of the wire, and where circuit breakers are used they should not be set more than 30% above the allowable carrying capacity of the wire unless a fusible cut out is also installed in the circuit.

Automatic circuit breakers open at exactly the current they are set for and instantly, therefore it is necessary to get them considerably above the ordinary amount of current required to keep them from constantly opening on slight fluctuations. When this is the case a double pole fusible cut out should be added to protect the wire from a long, steady current which might be maintained just below the opening point of the circuit breaker. The fuse requires a little time to heat and would not therefore blow out with a momentary rise of current which might open the circuit breaker if set as low as necessary to protect the wire, which may be of a size only large enough for the figured amount of current under ordinary conditions of operation.

If, however, as in the case of motor wiring the size of wire is 50% above the figured size for the motor's average current (as it should be), then the introduction of a fusible cut out in addition to the circuit breaker is unnecessary.

Fuses should be stamped with about 80% of the current they can carry indefinitely, thus allowing about 25% overload before the fuse melts. Fuses have been known to blow out simply from the heat due to poor contact when nowhere near their current carrying capacity had been reached. Carelessness, in the matter of installing fuses, should be avoided. They should be so put up and protected that nothing will tend to rupture them except an excessive flow of current. Insurance men should remember that no fuse of the larger size ever blew out without causing a greater or less fire danger. Central stations or large

isolated plants, subject to greatly varying loads, should have their lines and generators protected by both fuses and magnetic circuit breakers, as a double protection against rises of current.

The length of fuses and distance between terminals are important points to be considered in the proper installation of these electrical "safety-valves." No fuse block should have its terminal screws nearer together than one inch on 50 or 100 volt circuits, and one inch additional space should always be allowed between terminals for every 100 volts in excess of this allowance. For example: 200 volt circuits should have their fuse terminals two inches apart, 300 volts three inches, and 500 volts five inches. This rule will prevent the burning of the terminals on all occasions of rupture from maximum current, and this maximum current means a "short circuit." Good contact is absolutely essential in the installation and maintenance of fuses. See that the copper tips to all fuses are well soldered to the fuse wire, and furthermore see that the binding screw or nut is firmly set up against the copper tip when the fuse is placed in circuit; a 100 ampere fuse can be readily blown by 25 amperes if the above precautions are not carried out. Poor contact in every case can cause a heating beyond the carrying capacity of the largest fuses. On the other hand much damage can be done by using too short fuses and too large terminals, as the radiation of heat from the short piece of fuse wire to the heavy metal terminals and set screws or nuts can very easily raise the current carrying capacity of a fuse designed to carry 50 amperes to 100 amperes or even more.

Cut out cabinets should be so constructed and cut outs so arranged as to obviate any danger of the melted fuse metal coming in contact with any substance which might be ignited thereby.

Economy Coils

Or compensator coils for arc lamps should be mounted on glass or porcelain, allowing an air space of at least one inch between frame and support, and in general to be treated as sources of heat.

Electric Potential. Pressure = Potential.

A term used to indicate a condition to do work. The accumulated pressure of electricity in a cloud or Leyden jar is called static potential. A difference of potential between two bodies is necessary to produce a flow of current. When a pressure or electro motive force exists between the positive and negative, or + and − poles of a battery, there is said to be a difference of potential. A low potential is 300 volts or less. A high potential is over 300 volts.

The E. M. F. or electro motor force, difference of potential, or simply potential, are all used synonymously in electricity to denote the pressure.

Ground.

A ground or grounded, as used in electrical phraseology, means that somewhere in the circuit the electricity is escaping into the ground. It is the same as a leak in a water pipe. We may briefly state about electricity that according to well known principles it will flow to a body having more electricity from one having less. In a circuit, then, the electricity is always striving to escape to the earth, failing this it will go back to the dynamo by the shortest possible road.

Hanger Boards.

These are the boards or supports from which arc lights are hung. They should be so constructed that all lamps and current carrying devices thereon will be exposed to view, and the hanger board should be thoroughly insulated on a non-combustible, non-absorptive insulating substance, such as porcelain.

All switches attached to the hanger board should be so constructed that they will be automatic in their action, cutting off both poles to the lamp, not stopping between points when started, and preventing an arc between the points in all circumstances.

Induction and Induction Coil.

Induction. — A current is said to be induced in a conductor when it is caused by the conductor cutting lines of magnetic

force. A fluctuating current in a conductor will tend to induce a fluctuating current in another running parallel to it. A static charge of electricity is induced in neighboring bodies by the presence of an electrified body. A magnet induces magnetism in neighboring magnetic bodies.

Induction coil. — An arrangement by which an alternating or fluctuating current in a coil of wire will induce an alternating current in a parallel coil.

Insulating Joint.

An insulating joint is used when wiring is done on gas fixtures. Its object is to insulate so entirely the electric wiring from the gas piping that there will be no possibility of any ground connection being formed by means of the gas pipes.

Kilowatt *(See also Watt).*

A kilowatt = 1,000 watts, or 746 horse power.

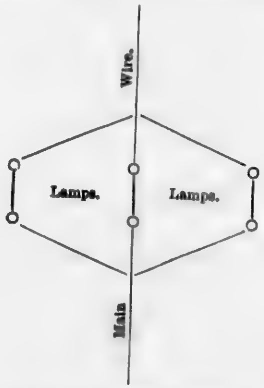

Fig. 5 — Multiple Series.

This term can be best explained by the illustration. It means a number of series lamps in multiple, and the danger is that should one or two of the series get out of order the current is

all sent through the remaining one, with consequent fire danger from the overheating of the wires.

OHM.

The unit of electrical resistance. That resistance of a conductor which will limit a flow of current to one ampere at a pressure of one volt.

PARALLEL SERIES, OR ONE FORM OF INCANDESCENT LIGHTING.

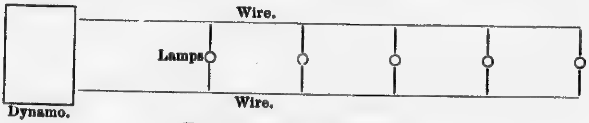

FIG. 6—PARALLEL SERIES.

Parallel series is the term used to denote the system wherein the lamps are connected across the wires, and each lamp forms a separate path for the current. In this case the number of amperes varies automatically as lamps are turned on or off and the voltage remains constant.

PRIMARIES.

Primary wires are the wires leading from the centre of distribution, *i. e.* from the dynamo to the transformer.

When connecting transformers to 1,000 volt mains a double pole cut out is placed in the primary circuit. For 2,000 volt circuits a single pole cut out should be placed in each side of the line, thus avoiding any possible short circuit due to an arc being established across the contacts of the double pole cut out. This, owing to the great difference of potential between opposite poles, is liable to occur when the fuses "blow." Primary wires should be kept at least ten inches apart, and at that distance from all conducting material.

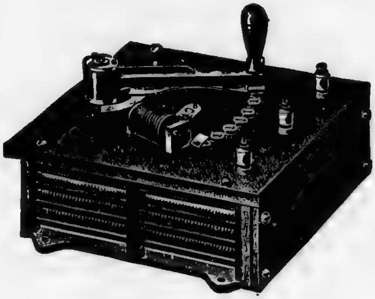

FIG. 7 — RHEOSTAT.

RHEOSTAT, RESISTANCE BOX, FIELD REGULATOR, STARTING BOX.

These terms all refer to the same machine. Resistance box is the best name as it partly explains the device.

As will be seen by the illustration, this is a box or apparatus for regulating the flow of current. Its principle is simply the checking or regulating of the current by throwing into it or taking out, as required, a certain resistance. The resistance is made through a number of coils of wire, and by means of a lever or handle the current flows through them all, or only part, as more or less flow of electricity is required.

Resistance boxes must be equipped with metal or other non-combustible frames. The word frame means the entire case and surroundings of the rheostat and not alone to the upholding supports. Rheostats must be placed on the switch board in power stations, and for small plants they must be well insulated from wood or other combustible material. As a large amount of heat is evolved in these boxes it will be at once seen why the above instructions are given. Good ventilation of the resistance box is also essential so that the heat may be quickly dissipated.

SECONDARY WIRES.

These are the wires which leave the transformer and run through the building.

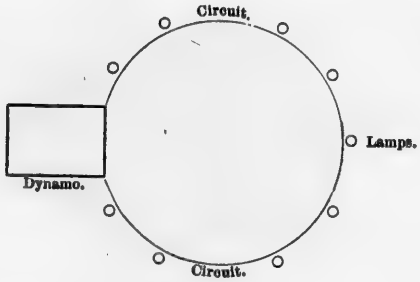

FIG. 8—SERIES CIRCUITS.

SERIES CIRCUITS, OR USUAL FORM OF ARC LIGHTING.

Series circuits are those where the lamps are all on one wire, and the current is forced through one after another. The voltage therefore has to be increased to drive the necessary number of amperes through the lamps as added.

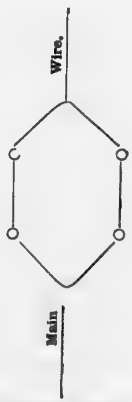

FIG. 9—SERIES MULTIPLE.

Series Multiple.

A reference to the illustration will show this system. It is a number of multiple or parallel lamps arranged in series. And the danger is in one side of the series being broken or getting out of order and thus throwing the maximum of current on the remaining connection.

Short Circuit.

If the words short cut were used instead of the above term it would almost save an explanation.

As we have endeavoured to explain, in the defining of a ground, electricity strives to reach the earth in every possible way. Failing this, its main desire is to get back to the dynamo. If it succeeds in either of these aims and finds a convenient path to the earth or to the dynamo a short circuit or short cut has been effected.

Let us illustrate: Suppose an incandescent light is carelessly hung on a nail, the nail driven in wood. After a time the insulation of the wire wears off and it effects contact with the nail. Instantly a short circuit or a ground is formed. The electricity will go down the nail into the wood, the latter being a semi-conductor, and thence to the ground. If the current is strong enough it will heat the nail and perhaps cause a fire. This explains why the insurance rules will not allow staples to be used as supports of wires, and in fact why the standard rule is given: "Wiring to be perfectly safe should touch nothing but glass or porcelain."

Again, take concealed wiring. Suppose when the wires are being drawn through or are being fished for, in order to pull them through the concealed space, that a part of the insulation is rubbed off the wire. Then if a nail or any conducting material should get across the wire a short circuit is formed at once and a fire is the probable result. Or if a screw or a nail in any of the electrical work, such as rosettes or fuses, should work loose and should manage to connect the two wires the electricity would find a short cut or short circuit back to the dynamo.

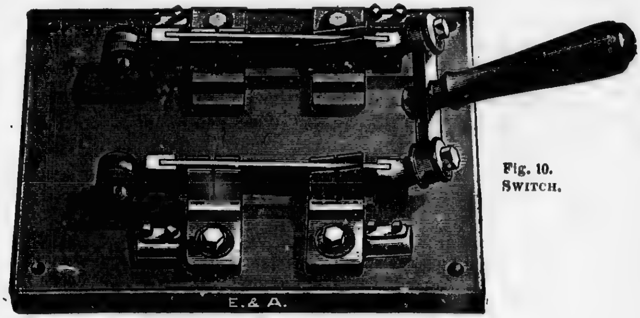

Fig. 10.
SWITCH.

SWITCHES.

A switch is a device similar to a circuit breaker, only with the difference that the circuit breaker is designed as a protection and usually works automatically, while the switch is used for disconnecting the wires when desired.

Switches for currents of over 25 amperes should be equipped with lugs firmly screwed or bolted to the switch, and into which the conducting wires should be soldered. For the smaller sized switches simple screws can be employed provided they are heavy enough to stand considerable hard usage. Holes for inserting screws for supporting the switch should not be placed between contacts of opposite polarity. All crossbars less than three inches in length should be made of insulating material. Bars of three inches and over, which are made of metal to insure greater mechanical strength, should be sufficiently separated from the jaws of the switch to prevent arcs following from the contacts to the bar on the opening of the switch in any circumstances. Metal bars should preferably be covered with insulating material.

All switches designed for use in breaking circuits of over 100 amperes at more than 200 volts should be equipped with auxiliary spring brakes, arranged to prevent arcing at the switch blades. Switches should be placed on all service wires, either overhead or underground, in a readily accessible place as near as possible to the point where the wires enter the building, and arranged to cut off the entire current.

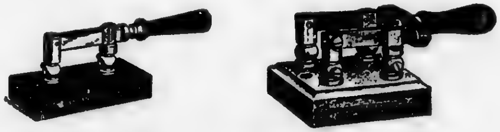

Fig. 11 — Knife Switches.

Knife switches should always be installed so that the handle will be up when the circuit is closed, in order that gravity will tend to open rather than close the switch. They should never be single pole, except when the current they control is carrying not more than six 16 candle power lamps, or their equivalent.

Double pole (or double wire, one on each wire,) switches are always preferable to single pole, as they absolutely disconnect the part of the circuit which they control.

Flush switches are switches flush with the wall.

Where gangs of flush switches are used, whether with conduit systems or not, the switches should be enclosed in boxes constructed of or lined with fire-resisting material.

When two or more switches are placed under one plate the box should have a separate compartment for each switch. No push-buttons for bells, gas-lighting circuits or such devices should be placed in the same wall-plate with switches controlling electric light or power wiring.

Fig. 12 — Snap Switch.

Snap switches work by a spring which, when released or fastened back, completes the circuit. Like knife switches, they should always be mounted on non-combustible, non-absorptive insulating bases, such as slate or porcelain, and should have

carrying capacity to prevent undue heating. When used for service switches they should indicate at sight whether the current be on or off. Indicating switches should be used for all work, to prevent mistakes and possible accidents. The fact that lights do not burn, or the motor does not run, is not necessarily a sure sign that the current is off. Every switch, like every piece of electrical apparatus, should be plainly marked where it is always visible with the maker's name, and the current and voltage for which it is designed. On constant, potential systems these switches should operate successfully at 50% over load in amperes, with 25% excessive voltage, under the most severe conditions they are likely to meet with in practice. They should have a firm contact, should make and break readily, and not stop when motion has once been imparted to the handle. When this style of switch is used for constant current systems they should close the main circuit and disconnect the branch wires when turned off: they should be so constructed that they will be automatic in action, not stopping between points when started, and should prevent an arc between the points in all circumstances. They should also indicate at sight whether the current is on or off and they should also have carrying capacity sufficient to prevent heating.

The following table shows minimum break distances and separation of nearest metal parts of opposite polarity for different voltages and different currents. The values given are correct for switches to be used on direct current systems, and can therefore be safely followed in devices designed for alternating currents:

300 Volts or less.	Separation of nearest metal parts of opposite polarity.	Minimum break distance.
10 amperes or less.	1½ in.	1¼ in.
10 to 35 amperes.	1¾ in.	1½ in.
35 to 100 "	2¼ in.	2 in.
100 to 1,000 amperes.	2½ to 3 in.	2¼ to 2¾ in.
300 to 600 Volts.		
10 amperes or less.	3½ in.	3 in.
10 to 35 amperes.	4 in.	3½ in.
35 to 100 "	4½ in.	4 in.

Telephone Wire Protector.

This is a device used on telephone wires to protect them against too heavy currents. A heavy current disconnects the wire.

Transformer.

The transformer, or converter, is a device for changing a heavy voltage system of say 1,000 volts or more to a low voltage system of 100 volts or less, or to change a low voltage system to a high one. They work both ways. They must not be attached to buildings, but should be located on the nearest pole. They must be placed in metallic or other non-combustible cases.

Volt.

The volt we have already explained. It is the unit of electro motive force (e. m. f.) or pressure. The power or intensity of one Daniell cell is equal to one volt. Ohms × amperes = volts.

Watt.

The unit of electrical power,—a volt × an ampere; 746 watts = one horse power. About 56 watts are required for one 16 candle power lamp.

End of Glossary of Terms.

INSIDE WIRING.

Approved rubber-covered wire.

The following wires, have been subjected to the required wire test by the Electrical Bureau of the National Board of Fire Underwriters of the United States, and are approved for inside wiring by insurance inspectors.

Name of Wire and Manufacturer.

Acme,.... ....Simplex Electrical Co., Boston, Mass.
Americanite,..............American Electrical Works, Providence, R. I.
Bishop,....................Bishop Gutta Percha Co., New York.
C. C.,......................Canadian General Electric Co., Toronto, Ont.
Clark, ...Eastern Electric Cable Co., Boston, Mass.
Climax,...................Simplex Electrical Co., Boston, Mass.

Crefeld,..................Crefeld Electrical Works, Boston, Mass.
Crescent, ...John A. Roeblings Sons Co., Trenton, N. J.
Crown,..... ....Washburn & Moen, Worcester, Mass.
Double Rubber Core,......General Electric Co., Schenectady, N. Y.
Double Rubber (Red Core), General Electric Co., Schenectady, N. Y.
Globe,...................Washburn & Moen, Worcester, Mass.
Grimshaw (White Core),...N. Y. Insulated Wire Co., New York.
Habirshaw (Blue Core),....India Rubber and Gutta Percha Ins. Co., Yonkers, N. Y.
Do. (White Core),..India Rubber and Gutta Percha Ins. Co., Yonkers, N. Y.
Do. (Red Core), ...India Rubber and Gutta Percha Ins. Co., Yonkers, N. Y.
Kerite,..................W. R. Brixey, New York.
N. I. R.,.................Natural India Rubber Co., Bristol, R. I.
Okonite, ...Okonite Co., Ltd., New York.
Paracore, ...Natural India Rubber Co., Bristol, R. I.
Paranite, ...Indiana Rub. and Ins. Wire Co., Jonesboro, Ind.
Phillips,..... ....Phillips Insulated Wire Co., Pawtucket, R. I.
Raven (Black Core),.......N. Y. Insulated Wire Co., New York.
Do. (White Core),......N. Y. Insulated Wire Co., New York.
Requa (White Core),......Safety Ins. Wire and Cable Co., New York.
Safety (Black Core),.......Safety Ins. Wire and Cable Co., New York.
Simplex (Caoutchouc),.....Simplex Electrical Co., Boston, Mass.
Sterling,.................Standard Underground Cable Company, Pittsburg, Pa.
Tip Top,.................Standard Underground Cable Company, Pittsburg, Pa.

A rule for safe wiring is the following:

Wiring, to be done correctly, should touch nothing but glass or porcelain.

One of the greatest dangers from electric lighting is the liability of the wires to heat. They will become red or even white hot, burning their insulating covering away and setting fire to everything combustible with which they come in contact. They will heat where anything causes a retardation of the current in them, or when any excess of electricity beyond their capacity to hold is poured into them. An important rule is that all wiring through walls, partitions or floors should be enclosed in glass or porcelain tubes. Each tube should be long enough to allow a projection of a quarter of an inch at both ends.

Where wires cross each other, tubes or pieces of porcelain should be placed between, to prevent the possibility of contact.

Binding wires should have the same insulation as the wire it binds.

Telegraph and telephone wires ought never to be placed on the same cross arm with light or power wires, or trouble will arise from induction, or an accidental contact between the two kinds of wires might result in starting a fire in the building to which the telephone wire is connected. All wiring should be kept free from contact with gas, water, or other metallic piping, or any other conductors or conducting material, which they may cross, by some continuous and firmly fixed non-conductor, creating a separation of at least one inch, and in wet places should be arranged so that an air space will be left between conductors and pipes in crossing, and the former must be run in such a way that they cannot come in contact with the pipe accidentally.

Wires should be run over rather than under pipes upon which moisture is likely to gather, or which by leaking might cause trouble on a circuit.

Flexible cord should not be used in show windows, as a defective piece might cause a short circuit, and set fire to flimsy material or decorations. Many fires have been caused by the use of flexible cord in show windows, where handkerchiefs, decorations, etc., have been pinned to the cord. When the current is turned on, short circuits are caused by the pins, and a fire is the result.

Important Rule.

Lighting and power from railway wires must not be permitted under any pretence in the same circuit with trolley wires with a ground return; nor shall the same dynamo be used for both purposes, except in street railway cars, electric car houses and their power stations.

No smaller size than No. 14 B. and S. gauge wire should ever be used for any lighting or power work; for though it may be large enough for the electric current, yet its mechanical weakness renders it liable to be stretched or broken in the ordinary

course of usage. Wires should never be laid in or come in contact with plaster, cement, or any finish, and should never be fastened by staples, even temporarily, but should always be supported on porcelain cleats, which will separate the wires at least half an inch from the surface wired over and keep the wires not less than two and a half inches apart. This style of wiring is intended for low voltage systems (300 volts or less), and where it is all open work rubber covered wire is not necessary, as weatherproof wire may be used. Wires should not be fished or looped for any great distance, and only in places where the insurance inspector can satisfy himself that it is all in order; as this style of work is always more or less uncertain and should be looked into carefully.

Twin wires, or two wires, both insulated, but under one cover, should never be used, except in conduits or where flexible conductors are necessary. They are always unsafe for light or power circuits, on account of the short distance between them. All wiring on side walls should be protected from mechanical injury. This can be done by boxing the wires, leaving an air space of one inch around the conductors.

When wires are run immediately under roofs or in proximity to water tanks or pipes they will be considered as exposed to moisture.

The rules for moisture-exposed conductors are as follows: Special wiring for damp places, such as breweries, packing houses, stables, dye houses, paper or pulp mills, or buildings specially liable to moisture or acid or other fumes which might injure the wires or their insulation, except where used for pendants, should always be done with approved rubber covered wire, and rigidly supported on porcelain or glass insulators which separate the wires at least one inch from the surface wired over and keep them apart at least six inches. The wires in such damp places should contain no joints or splices, as it is almost impossible to tape a splice so as to prevent acid fumes from getting at the copper surface. No switches, key sockets or fusible cut-outs will be allowed where exposed to inflammable gases or dust, or to the flyings of combustible material. In

damp places switches and cut out blocks must be mounted on porcelain knobs.

Arc Light Wiring.

All wiring in buildings for constant current series arc lighting should be with approved rubber covered wire, and the circuit arranged to enter and leave the building through an approved double contact service switch, which means a switch mounted on a non-combustible, non-absorptive insulating base, capable of closing the main circuit, and disconnecting the branch wires when turned off; it must be so constructed that it will be automatic in action, not stopping between points when started, and must prevent an arc between the points in all circumstances. It must also indicate upon inspection whether the current be on or off.

Such a switch is necessary for the firemen to cut the high voltage current completely out of the building in case of fire, or when it becomes necessary to make any changes in the lamps or wiring.

This class of wiring should never be concealed or encased except when requested by the electrical inspector, and should always be rigidly supported on porcelain or glass insulators which will separate the wiring at least one inch from the surface wired over and must be kept at least eight inches from each other on all voltages up to 3,000, and no wire carrying a voltage of over 3,000 volts should be run into any buildings except central stations and sub-stations.

All arc light wiring should be protected on side walls by boxing, as already described, and crossing floor timbers in cellars and in rooms where they might be exposed to injury they should be attached by their insulating supports to the under side of wooden strips, not less than half an inch in thickness and not less than three in width.

Moulding Work, that is where the wire is concealed behind raised mouldings, should always be done with approved rubber covered wire to prevent leakage should the moulding become damp. This class of work should never be done in concealed or

wet places, for fear that water may soak into the wood and cause leakage of current between the wires, burning the wood and starting a fire. The action of the current in a case like this is to convert very gradually the wood into charcoal, then dry the water out and ignite the charcoal thus formed. Great care should be exercised in driving nails into moulding, in order to avoid puncturing the insulation, and possibly grounding the circuit, in a way that would not only be difficult to locate, but might cause a concealed fire back of the plastering or woodwork to which the moulding is attached.

MOULDING should be of hard wood, and made in two pieces, a backing and a capping, so constructed as to thoroughly encase the wire. It should provide a half-inch tongue between the conductors and a solid backing, which, under the grooves, should not be less than three-eighths of an inch in thickness and be able to give suitable protection from abrasion.

CONCEALED WIRING, or that which is to be run between walls and floors or their joists, should always be done with approved rubber covered wire, and should be rigidly supported on porcelain or glass insulators which will separate the wires at least one inch from the surface wired over, and the wires should be kept at least ten inches apart. Where it is possible wires should be run singly on separate timbers or joists. The insulators should not be placed further than four feet apart in any case, and where there is any liability of the wires coming in contact with anything else, due to a possible sagging, the supports should be placed much closer together. This concealed wiring, when fished, is very dangerous, unless the pathways for the wire have been included in the plans of the building. The wire is put in at one end of the concealed space, and fished for from the other. It could easily happen that the insulation of the wire might be scraped off, and that the bare wire might be drawn against an old nail or some conductor. The workmen are in absolute ignorance of how the wires in the concealed space are situated. They may be all right, and they may not. All concealed wiring,

especially in old houses, should be looked into as carefully as possible. The National Board of Fire Underwriters of the United States, in their rules for safe wiring state the following for this concealed work:

"(1) When from the nature of the case it is impossible to place concealed wire on non-combustible insulating supports of glass or porcelain, the wires may be fished on the loop system, if incased throughout in approved continuous flexible tubing or conduit.

NOTE.—American Circular Loom tubing is approved for use under this rule.

"(2) Wires must not be fished for any great distance, and only in places where the inspector can satisfy himself that the above rules have been complied with.

"(3) Twin wires must never be employed in this class of concealed work."

FLEXIBLE CORD should be made of two stranded conductors, each having a carrying capacity equivalent to not less than a No. 16 B. and S. gauge wire, and each should be covered by an approved rubber insulation at least one-thirty-second of an inch thick, and protected by a slow burning, tough braided outer covering, preferably silk.

Insulation for pendants under this rule must be moisture and flame proof. Insulation for fixture work must be waterproof, durable, and not easily abraded.

Flexible cord must not sustain more than one light, not exceeding fifty candle power. It must not be used except for pendants, wiring of fixtures, and portable lamps, or motors.

It should not be used in show windows.

Must be protected by insulating bushings where the cord enters the socket. The ends of the cord must be taped to prevent fraying of the covering.

Must be so suspended that the entire weight of the socket and lamp will be borne by knots under the bushing in the socket, and above the point where the cord comes through the ceiling

block or rosette, in order that the strain may be taken from the joints and binding screws. Should be equipped with keyless sockets as far as practicable, and be controlled by wall switches.

Decorative Series Lamps. — Incandescent lamps run in series circuits shall not be used for decorative purposes inside of buildings except by special permission, in writing, from the Underwriters having jurisdiction.

Sockets. — (1) No portion of the lamp socket exposed to contact with outside objects must be allowed to come into electrical contact with either of the conductors.

(2) In rooms where inflammable gases may exist, or where the atmosphere is damp, the incandescent lamp and socket should be enclosed in a vapor-tight globe.

Incandescent Lamps have been known to start fires, and should not be allowed to touch inflammable material.

When in series circuits incandescent lamps should be wired with the same precautions as for series arc lighting, and each lamp should be provided with an automatic cut out. The lamp should be suspended from an approved hanger board by means of a rigid tube, to prevent the wire coming in contact with nearby objects, and also to prevent the possibility of breaking the wires from constant swinging.

No electro-magnetic device for switches, and no system of multiple series or series multiple lighting, in this class of work should be used. In no circumstances should incandescent lamps in series circuits be attached to gas fixtures, as the high voltage necessarily employed in this class of lighting should be kept as far as possible from gas piping, which is so thoroughly grounded, or at least very likely to be. When incandescent lamps are used for decorative purposes, as in the use of miniature colored lamps, and it is necessary to run two or more in series, permission, in writing, should always be secured from the Board of Underwriters having jurisdiction.

Arc Lamps must be carefully isolated from inflammable material.

Must be provided at all times with a glass globe, surrounding the arc, securely fastened upon a closed base. No broken or cracked globes to be used.

Must be provided with an approved hand switch; also an automatic switch that will shunt the current around the carbons should they fail to feed properly.

Must be provided with reliable stops to prevent carbons from falling out in case the clamps become loose.

Must be carefully insulated from the circuit in all their exposed parts.

Where readily inflammable material is in the vicinity of the lamps they should be provided with a wire netting, having a mesh not exceeding one and one-quarter inches around the globe, and an approved spark arrester above, to prevent escape of sparks, melted copper, or carbon. Plain carbons, not copper plated, are better for lamps in such places.

Where hanger boards are not used, lamps are to be hung from insulated supports other than their conductors.

Weatherproof Wires. — When inside wiring is done so that it is entirely exposed to view throughout the whole of the interior circuits, and not liable to be exposed to dampness, a wire with an insulating covering that will not support combustion, will resist abrasion (the insulation being at least one-sixteenth of an inch thick and thoroughly impregnated with a moisture repellant), will be approved, excepting under special conditions, as in chemical factories, and any place where the wires and insulation are liable to suffer from the fumes of chemicals, etc. The insurance inspector may then ask for some extra covering which will, in his opinion, withstand such attacks.

Stranded Wires in every case should be soldered together before being clamped under binding screws, and when they have a conductivity greater than a No. 10 B. and S. copper wire they should be soldered into lugs. Stranded wires, if not thus stiffened before being clamped under binding posts, are liable to be

pressed out or easily worked loose, making a poor contact which causes heating, a possibility of arcing, or a complete burn out or fusing of the wire at this point.

Fixture Work. — In all cases where conductors are concealed within or attached to gas fixtures, the latter must be insulated from the gas pipe system of the building by means of *approved* insulating joints placed as close as possible to the ceiling.

Insulating joints with soft rubber in their construction will not be approved. It is recommended that the gas outlet pipe be protected above the insulating joint by a non-combustible, non-absorptive, insulating tube having a flange at the lower end, where it comes in contact with the insulating joint, and that, where outlet tubes are used, they be of sufficient length to extend below the joint, and that they be so secured that they will not be pushed back when the canopy is put in place. Where iron ceilings are used care must be taken to see that the canopy is thoroughly and permanently insulated from the ceiling.

Insulating joints to be *approved* must be entirely made of material that will resist the action of illuminating gases, and will not give way or soften under the heat of an ordinary gas flame. They shall be so arranged that a deposit of moisture will not destroy the insulating effect, and shall have an insulating resistance of 250,000 ohms between the gas pipe attachments, and be sufficiently strong to resist the strain they will be liable to in attachment.

Supply conductors, and especially the splices to fixture wires, must be kept clear of the grounded part of gas pipes, and where shells are used the latter must be constructed in a manner affording sufficient area to allow this requirement.

When fixtures are wired outside, the conductors must be so secured as not to be cut or abraded by the pressure of the fastenings or motion of the fixture.

All conductors for fixture work must have a waterproof insulation that is durable and not easily abraded, and must not in any case be smaller than No. 18 Brown and Sharpe.

All burs or fins must be removed before the conductors are drawn into a fixture.

The tendency of condensation within the pipes should be guarded against by sealing the upper end of the fixture.

No combination fixture, in which the conductors are concealed in a space less than one-quarter inch between the inside pipe and the outside casing will be approved.

Each fixture must be tested for contacts between conductors and fixtures for short circuits and for ground connections before the fixture is connected to its supply conductors.

Ceiling blocks of fixtures should be made of insulating material; if not the wires in passing through the plate must be surrounded with hard rubber tubing.

Arc Lights on Low Potential Circuits must be connected with main conductors only through a double pole cut out and a double pole switch, which shall plainly indicate whether "on" or "off."

Must only be furnished with such resistances or regulators as are enclosed in non-combustible material, such resistances being treated as stoves. Incandescent lamps must not be used for resistance devices.

Must be supplied with globes and protected as in the case of arc lights on high potential circuits.

How to Find the Size of Wire Required. —The next point we shall take up is one of the most important in electric lighting; viz., to see that the size of wire used is sufficiently large to carry the current without undue heating.

The way this is done is by the application of Ohm's law, in which by knowing two of the quantities concerned the other can always be found. For example: Suppose it is necessary to supply current for 20 incandescent lamps at a distance of 500 feet. They are to be run on an 110 volt circuit, allowing 5 volts drop of potential in the wires that go to the group of lamps. The voltage of the circuit does not enter the problem except as it indirectly regulates the amount of current that is required for each lamp; 110 volts requires about .6 of an ampere.

The method of solving the problem of finding the size of the wire to be employed is as follows: There are 20 lamps each requiring .6 of an ampere, therefore the total current to be sent over the line is 12 amperes. The total length of wire to the lamps and back is 1,000 feet. The conditions are then that the drop of potential for 1,000 feet on wire carrying 12 amperes is to be 5 volts.

Since $c \times r = e$ this gives a difference of potential between the ends of the wire $r = e \div c$ or substituting the values of c and e which have just been found $r = \frac{5}{12} = .417$ ohms which is the resistance of the 1,000 feet of wire which will transmit 12 amperes with the given drop of potential.

If we turn now to the table below, which shows the current a wire will carry without undue heating, we find that the size of wire, the resistance of which per 1,000 feet comes closest to the resistance of .417 above, is a No. 6 B. and S. gauge. And this size should consequently be used in making such an installation.

In the same way the size of wire for any other wiring problem can be found. In such cases there is the allowable drop of potential and the current that must be transmitted; from the two can be found the permissible resistance of the wire, and then by reference to the wire tables the corresponding size of wire needed.

Suppose there are forty 50 volt lamps, which require about an ampere each at a distance of 100 feet with a drop of only one volt. A similar computation to the last gives $r = \frac{1}{40} = .025$ of an ohm. This is for 100 feet distance from the source of electricity, the total length of wire being therefore 200 feet. The resistance of the proper wire then, per 1,000 feet, must be .125 of an ohm. Looking this up, as before, we find the nearest size of wire to be No. 1 B. and S., which is therefore the size of wire to use.

CARRYING CAPACITIES AND DIMENSIONS OF WIRES

For Open and Concealed Work, as adopted by the Fire Underwriters of the United States.

Gauge No. B. and S.	Diameter Mils.	Area Circular Mils.	No. Amperes Open Work.	No. Amperes Concealed Work.	Ohms Per 1000 Feet.	Lbs. Per 1000 Feet Bare.	Lbs. Per 1000 Feet Insulated.
18	40	1,624	5	3	6.3880	4.92	18
17	45	2,048	6	4	5.0660	6.20	21
16	51	2,583	8	6	4.0176	7.82	25
15	57	3,257	10	8	3.1860	9.86	31
14	64	4,106	16	12	2.5266	12.44	38
13	72	5,178	19	14	2.0037	15.68	43
12	81	6,530	23	17	1.5890	19.77	48
11	91	8,234	27	21	1.2602	24.93	64
10	102	10,380	32	25	.99948	31.44	80
9	114	13,090	39	29	.79242	39.65	97
8	128	16,510	46	33	.62849	49.99	116
7	144	20,820	56	39	.49845	63.03	118
6	162	26,250	65	45	.39528	79.49	166
5	182	33,100	77	53	.31346	100.23	196
4	204	41,740	92	63	.24858	126.40	228
3	229	52,630	110	75	.19714	159.38	265
2	258	66,370	131	88	.15633	200.98	296
1	289	83,690	156	105	.12398	253.43	329
0	325	105,600	185	125	.09827	319.74	421
00	365	133,100	220	150	.07797	402.97	528
000	410	167,800	262	181	.06134	508.12	643
0000	460	211,600	312	218	.04904	640.73	815

Having now explained the fundamental principles of electricity, and laid down the definitions of the terms used, we come next to the dynamo or motor and the points in regard to which the insurance inspector should give attention. It must be remembered, however, that these instructions in regard to dynamos are gathered from the rules relating to central stations, and the inspector will therefore have to use his judgment when inspecting smaller plants.

The principal points are the following:

Oily waste must be kept in metal cans.

The dynamo must be in a dry cool place with plenty of air around it and on an insulated base. It should be kept clean and should have a rubber covering over it when not in operation.

The danger of water on a dynamo is this: The armature, as we have shown, is made up of insulated sections or coils. If then water, which is a semi-conductor, is allowed on the armature it forms a connection between these insulated parts, taking the current from the commutator and brushes and sending it around the armature. It thus burns out the insulation of these sections with, of course, more or less fire risk, and renders the dynamo useless until a new armature is put in. This is what is meant by the burning out of a dynamo.

The dynamo should not be placed in a room where any hazardous process is carried on, nor where exposed to inflammable gases or flyings of combustible material.

The name of the maker and the capacity in volts and amperes should be shown on all machines.

Conductors to outside lines must be in plain sight, or easily accessible. They must be run on non-combustible insulators of glass or porcelain, and separated from floors, walls, or partitions through which they pass by non-combustible insulating tubes of glass or porcelain. These wires must be kept apart so that they cannot possibly come together, and they must be covered with a non-inflammable insulating material sufficient to prevent accidental contact. They must have ample carrying capacity to prevent heating.

Switchboards must be kept in a dry place, away from any moisture and so as to obviate all danger of communicating fire; eighteen inches or two feet from floor and ceiling. There must be no concealed space for storage of oily waste or rubbish behind them and they must be accessible from all sides or against a brick or stone wall when the wiring is entirely on the face. The switch board should be made of non-combustible material or hard wood in skeleton form filled.

Every instrument, switch or apparatus of any kind on the switchboard must have its own non-combustible insulating base.

Resistance boxes and equalizers should be on metal or non-combustible frames. Frame, as used here, means the whole case and surroundings. Resistance boxes should be placed on the switchboard, or if not, one foot from combustible material or

separated therefrom by non-inflammable non-absorptive insulating material.

Lightning arresters should be attached to each side of every over head circuit and mounted on non-combustible bases. They should be in plain sight on the switchboard or in some accessible place away from combustible material. Lightning arresters should be connected with two earths by separate metallic strips or wires. These strips or wires should be of a conductivity of a not less than a No. 6 B. and S. wire. Strips must be in a straight line from the arresters to the earth connections. They should not contain an arc after discharge and should have no moving parts.

TESTING.—Series and alternating circuits should be tested every two hours. All systems of 300 volts or less must have an indicating or detecting device readily attachable to afford means of testing. All data must be kept for inspectors.

Motors should not run in series multiple or multiple series, and they must be wired with the same precaution as a current of the same volume and potential for lighting.

The motor and the resistance box must be protected by a double pole cut out or circuit breaker, and controlled by a double pole switch, indicating whether the current is on or off, except when one-quarter horse power or less is used on low tension circuits a single pole switch will be accepted. The motor should be thoroughly insulated and mounted on filled dry wood, raised at least eight inches above the floor. It should also be provided with pans to prevent oil soaking into the floor.

The motor should be kept clean and provided with a waterproof cover or an approved case for use when not running. In regard to the resistance box the same rules apply as for the resistance box of a dynamo.

INCANDESCENT LIGHTING.

We may recapitulate shortly the principal points in regard to the inspection of incandescent systems, to aid the insurance agent or inspector when going through the risk.

The transformer should be located away from the building.

The insulating tubes through which the wires enter the building should slant upwards, the outside end being the lower, and the wires should have drip loops before they enter the tubes. These insulating tubes should be of porcelain.

The general rules for inside wiring require that there should be a switch placed in the service conductors where they enter the building by which the current may be entirely cut off. This switch should be double pole.

The insulation should be according to whether the wiring is exposed to moisture or otherwise, as already laid down in this article, and the size of wire should be proportioned to the current used.

All wiring when passing through floors, walls, partitions, or timbers should be protected by glass or porcelain tubes, and all wiring should be done through double porcelain cleats.

The wires should be kept free from any conducting material, such as gas or water pipes. They should run over pipes when there is any danger of moisture. They should not be laid in plaster, cement or any similar finish, and they should never be fastened with staples.

Fuses should be placed in the wires as near the switch (if there is one) as possible, and if there is no switch the fuses should be close to the point where the wires enter the building. The mechanical execution of all electrical apparatus, such as fuses, rosettes, switches, cut outs, circuit breakers, etc., should be neatly and carefully done. Everything should be neat and tight; no loose screws or nails anywhere, or looseness in any part of the work.

The careful and neat running, connecting, soldering, and taping of fittings are especially conducive to security and efficiency, and should be strongly insisted upon. In cross wiring the wires should be separated by glass or porcelain. All binding wire must have an insulation equal to the wire it binds.

The Inspection of Arc Lighting.

Primary wires from roof structures, and outriggers or buildings, leading to lights below and when run along the face of buildings must be of specially insulated wire. They should be insulated from the building and fastened firmly to gas insulators. When the wiring is in proximity to windows, doors or porticos, it must be encased in glass or hard rubber tubing. Running wire on the face of buildings should be avoided as much as possible, and all wiring for constant series arc lighting should be with approved rubber covered wire. The wires must be covered to and through the walls of the building with extra waterproof insulation. There should be a drip loop on the outer side. The hole through the wall should be bushed with a waterproof and non-combustible insulating tube slanting upwards, the outer end the lower, and the tube sealed with tape, the tape thoroughly painted and securing the tube to the wire.

The importance of these regulations will be realized when it is remembered that many fires are caused by the wires where they enter the building. The wires swing, perhaps, and chafe, wearing off the insulation, and a ground, or arc, or short circuit forms, thus causing a fire.

The circuit should be arranged to enter and leave the building through an approved double contact service switch, on a non-combustible, non-absorptive insulating base, and capable of closing the main circuit and disconnecting the interior wires when turned off. This switch should be automatic in action, not stopping between points when started and no arcing between points. It should indicate whether the current is on or off.

Arc light wiring should never be concealed. It should always be supported on porcelain or glass insulators, and separated one inch from surface wired over — the wires eight inches apart. The wires must be protected when crossing floor, timbers and on side walls from mechanical injury, and when passing through floors, partitions, walls or timbers, by glass or porcelain tubes. All joints must be soldered.

Hanger boards must be so constructed that all wires and current carrying devices thereon shall be exposed to view and thoroughly insulated by being mounted on a non-combustible, non-absorptive insulating substance. All switches attached to hanger boards must be so constructed that they will be automatic in their action, cutting off both poles, not stopping between points, and preventing an arc in all circumstances.

When there are no hanger boards, lamps are to be hung from insulating supports other than their conductors.

Arc lamps should be carefully insulated and should have an approved hand switch. There should also be an automatic hand switch for the carbons so that they will feed properly. The stops for holding the carbons should always be in place.

The globes should be tight, made of glass and securely fastened upon a closed base. No broken or cracked globes allowed.

In inflammable places, plain carbons are better than copper coated.

Wires should be double fused where they enter the building.

All binding wire should have the same insulation as the wire it binds.

Arc wires should never be on the same cross arm as telephone or telegraph wires.

Summary.

The principal causes of fires in electrical wiring are the following, viz.:

1. Poor insulation and too strong current.
2. Grounds and short circuits.
3. Sparks from arc lights.
4. Incandescent lamps too near inflammable material.
5. Arcs and arcing.
6. Faulty joints.
7. Badly spaced wires.

CAUTIONS.

See that there is no danger of a ground from wiring making connection with gas or water pipes.

That there are no short circuits, or danger of arcing from loose screws or looseness in connections in any of the electrical fittings.

Insist on fuses at the point of entrance.

It must be remembered that the nearer the centre of distribution the greater the current, and consequently the greater the danger.

The following table, which however is merely illustrative, will serve to explain this:

E. M. F. or Volts.	Length of Wire.	Resistance in Ohms.	Current in Amperes.
50	100 feet.	20	2.5
50	50 feet.	10	5
50	25 feet.	5	10

So that a circuit of 25 feet of wire will have a current of 10 amperes as against one of 100 feet having 2.5, the other quantities being equal.

It should also be remembered that rubber, unless rendered waterproof, will deteriorate and in time form a good conductor.

Resistance boxes should be looked at carefully to see they are on proper fire proof bases, and well insulated and ventilated, as a great amount of heat is developed in these current regulators.

Concealed wiring is not considered altogether safe, and in old houses or houses not built to admit the wires it is dangerous.

The inspector should observe the situation of the wires as to danger of moisture — water being a semi-conductor.

Cleats should be double and of porcelain.

When a branch is put in a wire, that is where the wire is tapped to lead off in another direction, the branch should be supported by a cleat, and in no case should a drop light be put in without being supported by a rosette, or other approved means such as a cleat or porcelain knob.

Flexible cord should be covered with wool or silk, not with cotton.

Electrical heaters should be treated the same as ordinary stoves. The same precautions and care must be taken to prevent fire.

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COAL GAS.

Gas, as furnished by the gas companies, is a comparatively safe illuminant; and in spite of its deadly nature, when inhaled, and the poisonous properties of some of its components, it is much to be preferred, from an insurance standpoint, to kerosene.

Only a few cautions appear to be necessary.

The first is in regard to jointed gas burners. These are frequently turned against the woodwork adjoining and thus cause numerous fires. They should be provided with guards to prevent the possibility of such a contingency.

The second caution is never to approach a disordered gas meter with a lighted candle or open light of any kind. It is better to send for some one from the gas works and to endure a little inconvenience and delay, rather than endanger life and property.

A gas flame should never be within thirty-six inches of any over head woodwork.

The universal schedule charges five cents additional to the rate for a swinging gas bracket unprovided with stops or within thirty-six inches of woodwork over head, and one cent for each additional one.

CHIMNEYS.

The great importance of this feature of a building is too often overlooked. Yet the fires occurring from this cause are almost numberless.

In nearly all the classes of risks we have gone over defective flues have been mentioned as causing fires, and the percentage of losses due to this feature, especially in the common subjects of insurance, has been very high.

We quote a few of these figures which will show clearly the magnitude of the danger in a defective chimney.

The percentages of fires caused by defective flues in the following risks are:

Asylums,	46	per cent.
College buildings,	34	"
Court houses,	25	"
Country and general merchandise stores,	26	"
Dwellings and tenements,	29	"
Public halls,	21	"
Hotels,	40	"
Jails,	28	"
School houses,	34	"

Dwellings and tenements and their contents are, by far, the most common classes of property insured. The percentage then of 29 per cent. of all the fires in this class being due to defective flues shows clearly that there must be something wrong with the construction of the ordinary chimney in dwellings, or else that proper care is not taken in having the chimney periodically inspected and repaired as found necessary.

In chimneys where the fuel is wood there is the danger that the creosote thus formed will eat out the lime of the mortar, leaving only sand, and even if the chimney is plastered the same result will occur.

Chimneys burning wood are good for about five years; after that they become dangerous.

Tile or glazed tile chimneys are dangerous from the fact that they absorb moisture and are apt to freeze and split, thus opening cracks for sparks.

The Charges for Defective Chimneys.

In one rating schedule for a frame building we find the following charges in regard to chimneys:

Resting on attic floor beam or roof joist, charge for each, .	$0.25
Terra cotta, cement, tile, or inadequate for service required, charge for each,	.50
Not built from ground, charge for each,	.10
Iron inside, charge for each,	.50

The universal schedule charges are as follows, viz.:

Brick Building.

If not built from ground but resting on beams or brackets, charge for each,	$0.05

Note. — There should be not less than six courses of brick at the bottom, or three courses with a flag stone.

If inadequate for service required, or with flue walls less than eight inches thick — "one brick chimneys," unless latter are lined with pipe of burnt clay or cast iron, charge from	5 cents to $0.50
If chimney rests on attic floor beam or roof joist, charge in addition to the first item above,	.25
If constructed of poor bricks or mortar, charge not less than	.20
If cement or terra cotta chimneys, add	.50

Frame Building.

If not built from ground, but resting on beams or brackets, charge for each,	$0.10
If chimney rests on attic floor beam or roof joist, charge ..	.25
If cement or terra cotta, charge	.50

It will therefore be readily seen that the insured can save expense in the end, at least in places where this system of fixing rates is used, by building chimneys on correct plans. These charges also serve to emphasize good and bad construction.

In reference to grates and chimneys experts in house building have suggested that grates in second stories are usually less safe than those below, as the narrower joists give little room for the boxing of the hearth. It is also urged that grates be examined carefully to determine whether the back of the flue is simply of four inch wall, which is always dangerous at the back of a grate in a frame house. This can be found by measuring the distance the breasts extend out from the wall, and as sometimes the breast runs through flush with the face of the wall in the next room the calculation is to be made accordingly.

In one insurance book we find the following rules laid down:

Chimneys should be built from the ground, and where this is not possible they should be corbeled out of the brick wall; in no case should they rest upon wooden floor beams which are liable to settle and open cracks. Flue walls should be not less than eight inches thickness, and the inside or throat should be lined with cast iron or burnt clay pipes, which can be easily procured for the purpose. They should in all cases be of sufficient size to perform the service expected of them, and where connected with a steam boiler there should be not less than sixty-four square inches throat capacity. Only the best bricks and mortar should be used in constructing flues.

Brick Flues.

Brick flues built from the ceiling are dangerous. The pipe usually passes close to the wood; the slender joists are generally inadequate to the weight; the slightest yielding of the support causes the bricks to crack or separate and creates an aperture through which sparks or flame may pass. The flue usually goes through a garret out of sight and inaccessible. As the building settles or shrinks and the wood becomes dry, cobwebs and dust

accumulate, and the material for a fire is prepared, which the first spark — driven through the cracked flue by any gust of wind — may generate. An aggravation of this style of architecture is where the pipe, instead of entering the bottom of the flue, passes through the ceiling into the garret, and there, *with an elbow, enters its side.* This arrangement is so objectionable as almost hopelessly to condemn any risk in the eyes of a prudent underwriter. Another desperate feature is where these flues are partially supported as they pass the roof. If the bottom settles a crack occurs just underneath the sheathing, in the worst possible place for flames or sparks to pass out.

If flues must be built from the upper stories, they should be in sight their whole length; they should have a firm and adequate support, and be built from a stone or iron slab, having a hole where the pipe may pass directly into the bottom, and the whole pipe should be in sight. They should be free where they pass the roof, and rise high enough to discharge sparks clear of the shingles. A very good method is to start them a few inches below the ceiling, and support them by iron straps or stirrups. Another, is to build them from a post resting on the ground. These keep the point of connection between flue and pipe always in sight, which is a very important consideration. But even the best arrangement for entering the flue *perpendicularly* is dangerous when the chimney takes fire, as the burning soot may fall out at the bottom and fire the building.

The only safe foundation for a chimney of any sort is *terra firma.* Kitchen chimneys especially should always be built solidly from the ground.

Cement chimneys will not stand the weather, and should be prohibited on insured property.

Pipe holes in chimneys or flues not in use must be securely covered with metal caps.

Wooden fire boards, in front of unused fire places and grates, especially if there are fires above or below in the same chimney, are very dangerous and have been held by some companies to render a risk uninsurable.

A Safe Chimney.

We have drawn up the following regulations in regard to chimneys, and have had them examined by competent architects and builders. If these regulations are strictly adhered to the fire hazard of the chimney is practically eliminated:

1. Chimneys should be built from the ground, or supported on cast iron column; large furnace and boiler flues of eight inch brick work; regular grate and other small flues of four inch brick work. (The four inch chimney would be safe with the one inch air space all around it, and the eight inch back and jambs to fire places.)

2. Wooden beams or studding should not rest on or run into any part of the chimney, nor should a chimney be corbeled out for such a purpose. All woodwork must be kept distant, at least one inch, and in no case shall a nail be driven into the masonry of any flue.

3. Angles and turnings in flues should be avoided as much as possible. Attention should also be paid to the formation of the throat of the chimney, the sectional area of which in no case should be less than the sectional area of the flue.

4. The jambs and backs of all regular grate openings should be of eight inch thickness. All chimney brick work throughout to be laid in the best lime and sand mortar. The chimney is to be plastered the entire length inside and also on the outside from roof boards to bottom.

5. Regular grate backs and open fire place backs should be inspected every season before starting fires. The joints in the brick work to be tested with a knife or sharp iron, and if found soft to be painted with fire clay or otherwise made good.

6. Great care should be exercised in topping out a chimney; the joints in the brick work should be thoroughly filled as the escape of a spark at this point would quickly start a fire.

SUMMARY.

1. The chimney to be built from the ground, or on an iron column, and the backs of the fire places to be of eight inches thickness.

2. If not from the ground the supports to be adequate to the weight and no danger of the chimney sagging.

3. The chimney, where it passes through the roof, to be perfectly safe and no cracks or openings for sparks to escape.

4. The mortar to be tested with a knife or sharp iron to see that it is sound.

5. No beams or studding to run into or rest against the chimney.

6. Air space of one inch around chimney.

CAUTION.

All openings, such as pipe holes and unused fire places to be safely protected by covers of non-combustible material.

A preventive of smoke blowing down a chimney and consequent danger of sparks flying out into a room, is to be found in the light weight mica check valves which have for years been used in the chimneys in England.

FURNACES.

Furnaces are only responsible for about one per cent. of the fires in dwellings, but in other risks such as churches, halls, college buildings, court houses and jails the proportion is fairly large.

Furnaces in churches, for instance, cause twenty-four per cent. of all the fires.

Hot air furnaces have originated fires through defective construction or improper arrangement of flues and hot air pipes.

Ample room should be had in which to erect a furnace; when the space is cramped, either in height or area, an imperfect and unsafe heater is the necessary result.

Flues for smoke or hot air should be several inches from wood, and one register—the main one if practicable—should be so constructed that it cannot be shut at any time. Registers should always be laid in soapstone.

Much careless mechanism is indulged in the erection of "heaters;" they should be put up only by careful and experienced men. Plenty of head room must be secured so as to relieve the floor above from all possible danger. The cold air chamber or feeder should always be of brick or metal and *never of wood.* Reverse currents of air, sometimes created by unusual winds blowing through open doors or windows, while certain registers are open and others shut, will set wood on fire in a very few moments.

There is also another consideration in regard to the cold air chamber being of non-combustible material. A metallic cold air box or duct of tin or galvanized iron, is essential for health as well as for safety from fire. A wooden box soon opens joints or cracks from shrinking, taking the foul air of the cellar from damp coal, decaying vegetables, etc., and forcing it throughout

the living and sleeping rooms of the house by the operation of the furnace. If property owners could be made to realize this all cold air boxes would be of metal.

Portable heaters must be kept at least two feet from partitions and ceiling, and then it will be well to add the protection of sheet iron or zinc. These heaters should stand on the ground, but if they are placed on wooden floors they must be on large stones or courses of bricks well laid in mortar. The stone or bricks to extend at least two feet in front of the ash pan.

Smoke pipes of furnaces should go direct into chimneys but if they pass through floors, walls or partitions they must be cased in brick or stone or pottery or have double tin collars with ample air spaces.

The following further specific instructions in regard to the erection of hot air furnaces are from the laws regulating the construction of buildings in St. John :

1. In all cases where the hot air chamber in which the furnace is to be placed is made of brick, it should be built upon a stone foundation and of at least eight inch brick work well laid in mortar, and arched over the top with eight inch work, with a lining of tin inside the arch, in which lining of tin the warm air tubes should be properly riveted ; and they should be also made to pass through the arch, the arch to be surrounded with an iron band four inches by one-quarter of an inch, to keep the brick work together.

2. A space of at least twelve inches should be left between the upper surface of the warm air chamber and the bottom of the beams or ceiling; the beams or ceiling should be covered with a sheet of bright tin plate, secured thereto, seamed or soldered together, which should extend six inches beyond the top of the furnace on three sides, and one foot six inches on the front above the furnace door.

3. When portable furnaces are to be used, they should be placed on a cast iron pan or stand, said pan or stand to be placed upon a layer of brick, tiles or other non-combustible material (if on a wood floor), the pan or stand to project three

inches beyond the hot air sheeting; and if the furnace top is within two feet of the ceiling or beams, then the ceiling or beams should be protected in the same manner as in the brick furnace as mentioned above.

4. The smoke pipe should be made of at least No. 20 sheet iron, and of a size proportionate to the furnace, and provided with a key or damper to check the draft. The said pipe must be properly joined; should be nine inches from any woodwork, and should be conducted into a proper chimney.

5. The warm air tubes from the top of the furnace under the first floor should be made of bright tin, and should not pass nearer than four inches to any woodwork, and be enclosed with solid brickwork; or said hot air tubes may consist of double tubes made of tin plate riveted together at the joints, the space between them to be filled up with plaster of paris.

A few further general instructions in regard to the safe installation of hot air, hot water or steam furnaces, are the following:

The furnace should be set solidly upon a foundation of brick, stone or earth. If upon a wooden floor the furnace should rest upon brickwork, which should be extended a foot on each side and two feet in front. Any woodwork within two feet should be protected by tin.

A space of at least eighteen inches must be left between the top of the furnace, if hot water or steam, and the beams or ceiling protected as in the second regulation above for hot air furnaces.

If the smoke pipe passes through any wall or partition before entering the chimney, it should be protected in one of the following ways:

1. By having a large aperture in the wall and a collar of tin around the pipe; diameter not less than eighteen inches to insure six inches distance from wood.

2. By a double tin collar with a wide air space between; air space not less than four inches.

3. By a double tin collar, and the space between filled with plaster of paris or asbestos.

4. By being cased in brick, stone or pottery.

Ashes.

Ashes should never be taken up in a wooden box or bucket; they should stand in metal or earthenware until cold, or be removed at once to a safe distance. The careless disposition of ashes has occasioned a great many fires.

A safe and cheap depository for ashes is made by digging a pit in the yard that can be covered with metal or a stone slab.

It is a well known fact that ashes, especially wood ashes, will hold fire for a long time. Coal ashes are not as dangerous as wood ashes, but the same precautions should be taken for both so as to secure absolute safety.

HEATING.

Hot Water, Hot Air and Steam Pipes.

There is a certain amount of fire danger in these forms of heating but it can be obviated by very simple precautions.

These precautions, however, should be carefully observed.

In a circular issued by Mr. W. M. Jarvis, the agent for the Maritime Provinces of the Liverpool and London and Globe Insurance Company, we find the following detailed instructions in regard to hot air registers:

All hot air registers placed on the floor of any dwelling, store, church or other building should be set in soapstone borders of the following dimensions, to wit: Registers smaller than twelve inches long by nineteen inches wide, should have a soapstone border not less than three inches in width and one and a quarter inches in thickness. All registers, twelve by nineteen, and less than fifteen by twenty-five inches, should have a border not less than five inches wide and one and a half inches in thickness; and all registers fifteen by twenty-five inches or more should have a border not less than six inches wide and two inches in thickness. All soapstone borders to be firmly set in plaster of paris or gauged mortar; all register boxes to be double, and to

be made of tin plate with a flange on the top to fit the groove in the soapstone. There should also be an open space of two inches on all sides of the register box, extending from the underside of the ceiling below the register to the soapstone in the floor; the outside of said space to be covered with a casing of tin plate, made tight on all sides, to extend from the underside of the aforesaid ceiling up to and turn under the said soapstone. Registers twelve by nineteen inches, or less than fifteen by twenty-five inches, should have a space of three inches between the register-box and casing. Registers of fifteen by twenty-five and more should have a space of three and a half inches. All horizontal registers should have a diaphragm of wire cloth so placed as to prevent any dust, sweepings or other combustible from entering the hot air tubes. All the openings through the base or skirting should have a stone frame, or double tin filled with plaster of paris one inch in thickness, through all the wood work.

In the same circular the following rules are laid down for steam and hot water pipes:

No high pressure steam pipe should be laid or placed in contact with any wood between floors and ceilings or in plastered walls or partitions. When such steam pipes are used for heating, they should be placed or enclosed in brick mortar or other incombustible substance, and an air space left around the pipe.

No pipe for the conduct of steam or hot water should be placed in contact with woodwork. All such pipes should be supported on metal hangers, and an air space of at least an inch should intervene between the heated surface and any woodwork or other inflammable substance near.

These directions are based on the well-known fact that woodwork and other inflammable substances exposed to unusual heat become gradually charred, and fire may be generated, though perhaps not until after the lapse of years.

The charges under the mercantile rating schedules vary:

The New England Insurance Exchange mercantile schedule states: "For steam pipes, not properly guarded, add .01 to 10c. to the rate."

The universal schedule charges as follows: "Hot air pipes, if pipes pass between studs in hollow lath and plaster partitions, or horizontally between floors and ceiling below, charge additional .02. Steam pipes in contact with wood work, charge .01."

To show that there is real danger in steam pipes we give the following percentages of fires caused by them in different classes of risks. (Chronicle fire tables).

Boot and shoe factories,	5	per cent.
Clothing factories,	2	"
Cotton factories,	1	"
Public halls,	1	"
Wholesale groceries,	4	"
Jails,	3½	"
Wholesale liquor stores,	3	"
Planing and moulding mills,	2	"
Railroad and car and repair shops and round houses,	3	"
Railway stations,	1	"
Sash and door factories,	1½	"
Tanneries,	8	"
Soap and candle factories,	5	"
Opera houses,	1½	"
Tobacco factories (cigar and cigarette),	2	"

The following caution is given in regard to hot air pipes passing up in plastered partitions: The face of the studding should be tinned and the laths made of sheet iron. If this is not done there is great danger of fire breaking out. Steam pipes should never be in contact with wood work.

The Insurance Monitor has the following in regard to steam heating: "Unprotected steam pipes, where passing woodwork are as dangerous as furnaces. Tyndall demonstrated that pine carbonizes at two hundred and fifty degrees. After carbonizing, if the steam in the boilers exceeds this heat, there is danger of ignition. When the steam pressure on the boiler is twenty pounds, the heat equals two hundred and twenty-eight degrees. With forty pounds pressure the heat is two hundred and sixty degrees; and with sixty pounds pressure the heat is three hundred and fifteen degrees. So when the pressure gets up to thirty pounds it will readily be seen that the steam pipes must be

looked after without delay. Pine not carbonized ignites at six hundred degrees. Steam pipes that pass through wood or lath and plaster partitions, or through floors should be wrapped with asbestos or have a clear space from the woodwork of at least one and one-half inches."

MATCHES.

Matches should be kept in metal or earthen safes.

They should not be left around carelessly or outside of match boxes, match safes, or other not dangerous places.

Rats and mice have been known to start fires by gnawing matches and lighting them in that way, or they will carry them off to their nests, perhaps against or near a warm hot air or steam pipe, and a mysterious fire breaks out, for which the insurance companies are invited to pay.

Matches should be kept out of the sight of children.

Some people have a careless habit of throwing the burning match, after it has served its purpose, in the waste paper basket or on the floor. Needless to say fire has resulted.

Safety matches, which ignite only by contact with a prepared surface, would, if generally introduced, largely eliminate the fire danger from this prolific source.

There is in addition to the above a danger of the oxidation of matches. It is stated that the ordinary lucifer match composition is luminous in the dark on warm summer nights, which shows that oxidation and therefore a process of heating is going on. Hence, large quantities of these matches kept in contact may produce a heat sufficient for their ignition. Dr. Taylor, in his Principles and Practice of Medical Jurisprudence, 1865, page 603, states that he has seen them ignite as a result of exposure to the sun's rays for the purpose of drying.

THE MORAL HAZARD.

In fire insurance the sum total of the risk assumed by the insuring company is composed of two parts, known as physical hazard and moral hazard. Physical hazard is inherent in the property itself or in its exposures. Moral hazard lies entirely in human motives which may exist either in the mind of the owner himself or in the mind of another person or persons. When a motive of interest exists in the mind of the owner, its cause is almost invariably over-insurance, and what constitutes over-insurance is a difficult thing to determine for anyone not gifted with the power of mind reading. Circumstances frequently create a moral hazard when the property is seemingly insured for much less than its value. People are frequently anxious to dispose of property at a sacrifice for ready cash to avail themselves of some opportunity for what promises to be a profitable investment, or they are sometimes willing to make a similar sacrifice for cash in order to extricate themselves from some financial or social entanglement which threatens to involve their good name. Again, circumstances may arise which threaten to depreciate the value of insured property, making a hurried sale advisable. In any of these cases moral hazard may exist when the property was not seemingly over-insured at the time of the fire, and was not in fact over-insured when the risk was written. From the standpoint of the owner over-insurance may be said to exist whenever the insurance is or may become sufficient on the one hand to destroy all desire for the preservation of the property, or on the other hand to create a desire to exchange the property for the insurance money.

The moral hazard of a risk was most pertinently defined by Colonel Ducat, as the danger from friction caused by high insurances and low depreciated stocks and property coming together. And just the difference between the fire loss with no insurance and the fire loss under insurance, would be the moral hazard of the risk.

It is universally conceded that this moral hazard is much the larger proportion of the risk: hence, in estimating the value of a hazard it becomes of vital importance "to know the man"—his character, antecedents, business habits, commercial standing and pecuniary responsibility—which may be said to comprise the "unknown quantity" in the calculation.

To such an extent is this true that to many thinking minds it is a question of serious import whether fire insurance is or is not a benefit to the community at large. Whether by holding out to the losing speculator or merchant the fearful temptation of a ready market for his property, where the skilful salesman "fire" may dispose of it with small loss and perhaps without detection, the immunity of the incendiary does not bring insecurity to property and entail severe losses upon the commonwealth; for property destroyed by fire is not restored to the state by payment of indemnity to the individual.

The inference from this state of facts again is, that carelessness—interested carelessness—is very often the cause of losses by fire, and the question suggests itself as to whether the distinction between one who *allows* his property to burn because he is insured, and he who fires it to obtain the insurance, is not rather in degree than in kind.

How shall this moral hazard be met and rated is a query more easily put than readily solved.

Some say raise the rates, but premiums may be raised to such an extent as to be beyond the reach of honest men, yet still not be too high for knaves who will pay any premium upon property they propose to burn. Others again place their faith in limiting the lines. This may operate in individual cases, where the parties are known; but if known unfavourably or not known at all they were better left alone; and in the event of doubt give the company the benefit of such doubt, and let the applicant seek elsewhere for his insurance.

The insurance agent should guard against moral hazard above everything else, and if any taint of it be developed in the course of examination of the risk, refuse the line unconditionally.

This danger to the companies is most difficult to discover, because it is hidden from view in the breast of the intending incendiary, who may be of accepted respectability and standing. In a matter of this kind there is great need to exercise judgment and firmness. The agent cannot without offence proclaim his motive for declining the risk, but if any reason whatever appears why the insurance money might be better to the applicant than the property, or if threats, litigation, disputes or an embarrassed business appear, refuse the line. A good rule for insurance agents is never to take a risk under the pressure of importunity, against the verdict of their judgment and with a lingering feeling of uneasiness about something that may afterwards lead them to wish it had not been accepted.

But the matter of moral hazard is not so intricate that there are no guides to a successful solution of the problem.

In regard to the moral hazard of a man there are certain questions, well known amongst insurance men, which, when answered, will greatly aid the agent in his decision to accept or decline the line offered.

The character and standing of the applicant furnish the index to these questions.

If he is honourable, systematic and business like he will be less likely to have enemies, either within or without, than a dishonest, careless or litigious person.

Let the agent then inform himself as to the following points, after which, if they are satisfactorily answered, he may accept the risk with a sense at least of having done his duty:

1. Is the party unpopular, grasping, overbearing, litigious, tricky, dishonest?

2. Is he losing money? Is he embarrassed and desperate?

3. Has he never insured before, but suddenly become convinced of its importance?

4. Has he been threatened; or is he a man hated and feared in the neighborhood and abounding in enemies?

5. Has he a bad lease?

6. Is the property in dispute or litigation? Is it unproductive and unprofitable? Is it a stock of remnants or a branch store — an unsalable, unfashionable, depreciated or damaged stock?

7. Is it in the hands of the sheriff or assignees? In the former case it is undoubtedly the subject of threats and revenge.

8. Have there been any former fires under suspicious circumstances? And was there any insurance?

9. Is the business an experiment — some patent clap-trap of questionable value?

10. Is the management careless, improvident or unsystematic?

11. Has he made any attempts to sell?

12. Is an excessive amount of insurance asked for; or an over-valuation stated? This is a sure sign of something wrong.

In fine, if circumstances indicate in any way that it would be an object for the applicant to realize on his insurance refuse to insure him, or if any question arises in regard to any of the above matters do not grant a policy until it is cleared up in the most satisfactory manner.

There is also the moral hazard of watchmen to be guarded against. Many guardians of property, who watch at night, are trustworthy; but it is a notorious fact that watchmen have been hired to burn property, or to connive at its destruction. They are peculiarly exposed to approaches of this kind from designing men, and agents must not overlook this point of danger. It is well to be posted in regard to the character of the person in charge during the night.

Lastly there is what we may term an external moral hazard, or moral hazard other than that of the owner.

Moral hazard, on the part of others than the owner, arises from a variety of causes, but may be divided into four classes:

1. That which arises from a personal interest in the owner or property. This interest may be that of a relative, friend, creditor, heir or shareholder, or of any other person who may see an opportunity of realizing upon an interest in or claim upon the assured or his property through the medium of insurance.

2. Enmity against the owner. This enmity may be widespread, though subtle and concealed, as in personal or local feuds, feuds of a political or business nature, business rivalries, etc. A man of unquestioned character may have bitter and unscrupulous enemies, even unknown to himself, which fact may make his property very undesirable as an insurance risk, though he be personally above suspicion.

3. Antagonism against the property itself. This species of moral hazard applies particularly to property which interferes with the rights, comforts, pleasures or success of other people, as, for instance, a slaughter house which taints the atmosphere, a tannery or paper mill which pollutes the water of a running stream, buildings which shut off the air, light or view of other people, or which, from their unsightly appearance or occupancy, depreciate the value of neighboring property, as livery stables, saloons, houses with disreputable occupancy, etc.

4. Under this head may be grouped pyromaniacs, the victims of an insane desire to start fires; evil disposed persons who start fires for purposes of robbery or from an indiscriminate hatred against all property, or even for mere amusement; tramps, and in rare cases amateur fire departments who kindle an occasional fire for exercise, or to convince the public that they are entitled to salaried positions, as at Blue Island, Ill., where for more than a year, according to the confession of some of the participants, it has been the custom to take a secret ballot to decide which fireman should start the next fire.

No rate can be fixed for property menaced by human motive or interest; hence the companies make no charge for moral hazard. Every company accepts each individual risk on the assumption that it is to the interest of the owner that it shall be preserved, and that it is not to the interest of any human being that it shall be destroyed. The local agent with his local experience often lives out his appointed days without more than a hearsay knowledge of what is known as moral hazard, and the president or manager, while brought into daily and hourly contact with it, is utterly unable to estimate its metes and bounds.

There are facts in the archives of every company and in the memory of every adjuster which are not, and never will be, added to the common fund of knowledge upon the subject. To study moral hazard is to enter into an analysis of human motives in all their ramifications, but as an applied science from the local agent's standpoint it resolves itself into the standing interrogatory — is it to the interest of the owner or any other person that this or exposing property shall be destroyed by fire?

FIRE PREVENTION, RETARDATION AND PROTECTION.

FACILITIES FOR EXTINGUISHING OR RETARDING THE PROGRESS OF FIRE.

SUGGESTIONS FOR INTERNAL FIRE PROTECTION FOR OWNERS AND OCCUPANTS OF PROPERTY, IN ADDITION TO MUNICIPAL PROTECTION OR IN SUBSTITUTION THEREOF.

Supplementing the suggestions we have already made in the articles preceding this, relative to the prevention of fire from ordinary causes, there are some precautions which may be taken, and which may avert loss and damage by being ready in an emergency.

Some of these are inexpensive and easily obtained. These consist of the following:

1. Pails and casks of water.
2. Chemical fire extinguishers.
3. Small stand pipe and line of hose.
4. Covers, tarpaulins, and tin covered cases.
5. Skylight protections.
6. Ladders.

Others again are more costly such as:

7. Standard fire doors and shutters.
8. Large stand pipes, internal and external.
9. Sprinklers.
10. Basement and sub-cellar sprinklers.
11. Sprinklers and thermostats.
12. Watchman and clock.
13. Making accessible or doing away with roof spaces, blind attics and cockloft.

14. Elevators in fire proof or fire resisting shafts, and with self closing fire resisting hatches, and the abolishing of light wells and other vertical hazards.

We will now take these up more in detail.

I. — Fire Pails and Casks of Water.

There should be at least six filled pails for each two thousand five hundred square feet of floor area. If one-half the number of pails be filled with sand, especially in oil stores, sand being better than water for oil fires, or where water would be likely to freeze it would be an improvement. Or an excellent combination to fill fire barrels with is one pail common salt and one-half pail sal soda in a barrel of water. This will keep the water sweet and will not freeze.

II. — Chemical Fire Extinguishers.

These machines have at times prevented an incipient fire from spreading. One case to our knowledge proved their usefulness, and all the catalogues dealing with them contain testimonials of their value from reliable people. The case to which we refer occurred in Truro. A small fire broke out in a hotel located in a dangerous block. The hotel clerk closed the doors and shutters and quenched the blaze with a chemical fire extinguisher, and by prompt action and by having the apparatus ready averted what might have been a disastrous fire.

Perhaps a short explanation of their fire extinguishing qualities and method of working may be of service.

Chemical fire extinguishers then consist of a cylindrical copper case with an opening and cap at the top; a small piece of hose is attached. First, one and one-half pounds of pure baking soda are put in the cylinder. Next, a heavy lead ball is dropped on this. Then water is poured in to within four inches of the top, and the soda and water are thoroughly stirred until the soda is dissolved. A small bottle, containing sulphuric acid, is placed in the opening in the top and the cap securely screwed on. The machine is then ready for use.

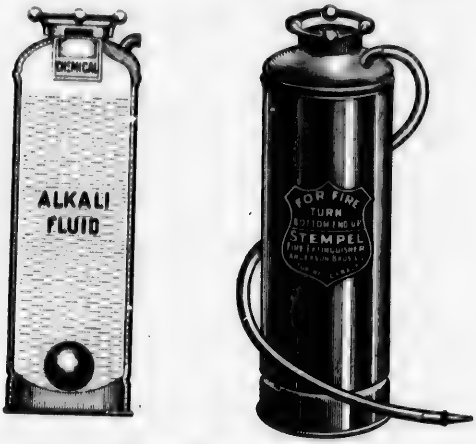


FIG. 13—CHEMICAL FIRE EXTINGUISHER.

The *modus operandi* in case of fire, is as follows:

The cylinder is quickly turned up when the lead ball falls on the bottle, breaking it and releasing the sulphuric acid. This sulphuric acid, acting on the water and soda, charges the cylinder with carbonated water at a high pressure. This carbonated water contains carbonic acid gas, which, as is well known, is a non-supporter of combustion, and being heavier than the air floats down over a fire and extinguishes it. This carbonated water is played on the fire, being always applied at its base and following the fire upwards as the blaze is extinguished.

On reading over the catalogues of these machines we have found some wonderful statements which demonstrate the great utility of these inventions.

Large fires were made by means of kindling wood and oil; the flames rising fifteen and twenty feet in the air. These fires were allowed to get good headway and were burning fiercely when the extinguisher was turned on. A three gallon "Stempel" chemical fire extinguisher in each case put these fires entirely out in less than a minute.

Their practical utility having been thus established we would recommend their use as a cheap and seemingly effective protection against fire.

They cost fifteen dollars each, or ordered by the dozen ten per cent. off; so that the cost of supplying a building with enough to materially add to its protection would be light.

We think also that the Underwriters' Boards should allow a certain reduction in rate when these machines are kept on the premises.

We give in full the report of the committee of the National Fire Protection Association on Carbonic Acid Gas Extinguishers:

STANDARD FOR CARBONIC ACID GAS FIRE EXTINGUISHER FOR OTHER THAN FIRE DEPARTMENT USE.

Construction.

1. Shell to be made of hard copper or brass heavy enough to withstand a hydrostatic pressure of three hundred and fifty pounds per square inch. Each extinguisher to be tested and so labeled.
2. The interior of the shell to be coated with lead, or some similar metal withstanding the action of chemicals used or formed in the extinguisher when in use. Joints and rivets, if any, to be covered in such a manner as to form a smooth surface in the interior of the shell.
3. Opening at top of shell to be not exceeding three and one-half inches, and not less than two and one-half inches diameter; to be closed by a screw cap so arranged that the screw threads shall not be exposed to the chemicals contained in the extinguisher. A rubber washer not less than one-sixteenth inch thick to be used at the joint.
4. A suitable handle must be permanently attached to the cap, so that it can readily be unscrewed even when badly stuck.
5. Handles to be firmly attached to top and bottom of the extinguisher, to be fixed and not hinged.
6. Cage supporting acid bottle to be strongly constructed of metal, arranged in such a manner to allow the ready removal and replacement of the acid bottle.
7. All metal portions of cage to be coated with lead or some similar metal not subject to corrosion by the chemicals contained in or generated in the extinguisher when in use.
8. Acid bottle to be preferably of commercial size, which can be readily replaced, and unless hermetically sealed, of such capacity that the acid required for one charge will not more than half fill it.

9. Outlet to be within one inch of top of extinguisher, provided with a short metal pipe to which rubber hose can be attached; to be screened with copper or brass netting protected against corrosion by lead or similar metal.

10. There shall be no valve in the outlet.

11. Hose to be of best quality three ply rubber tested to four hundred pounds per square inch, and so attached to outlet pipe that it can be readily removed and replaced when necessary.

12. Nozzle to be of lead or similar metal not subject to corrosion, having an outlet not less than one-eighth inch and not more than three-sixteenths inch diameter.

Chemical Charge.

13. Acid (sulphuric) and chemical (bicarbonate of soda) to be in such proportions that a pressure of three hundred and twenty-five pounds at a temperature of one hundred and twenty degrees when in operation cannot be exceeded, and also that liquid discharged from the extinguisher contains alkali in excess.

One and one-half pounds bicarbonate of soda and four fluid ounces sulphuric acid, recommended for a three gallon extinguisher.

Directions for Use.

14. Directions for operating the extinguisher to be plainly and permanently marked on the side of the shell in letters not less than three-quarters inch high, and of different color than background.

15. Name and address of maker, and directions for recharging to be plainly and permanently marked on the shell. Directions to state that the extinguisher, if not used for a fire, must be discharged and recharged at least once every year.

III.—Small Stand Pipe and Line of Hose.

A small stand pipe, running up through the centre of a building with a swinging hose rack attachment and a length of hose, say twenty-five feet, would be very serviceable in case of a small fire breaking out in a place out of reach of the fire pails. For such a pipe two inch or two and one-half inch linen hose could be used.

There is a large quantity of inferior hose on the market, but it is hardly necessary to remark that only the best should be kept for fire purposes.

IV. — Covers, Tarpaulins and Tin Covered Cases.

If covers and tarpaulins were kept and put over exposed merchandise each night they might be the means of averting a heavy water damage in case of fire.

Another suggestion, which we find in the Universal Schedule, is tin covered cases or tin covered wooden side walls for merchandise. These cases may be economically made of ordinary white pine, covered with tin in the same manner as tin covered doors and shutters are made (see standard fire doors and shutters), and may be grained to resemble woods or may be veneered with real woods — mahogany, cherry or others — without impairing their fire resisting qualities. Especially should the top and back of the case be covered with tin to shed water, the top being inclined to throw the water beyond the line of frontage. If tin covered sliding doors to these cases would prevent the display of stock, glass doors may be used which would save such stocks as hats, millinery, silks, cutlery, etc., from water damage.

V. — Skylight Protections.

Unless skylights are of heavy hammered glass, at least half an inch thick, and with iron frames they should be protected with heavy wire netting above them. This wire netting should be supported on iron frames from four to six inches above the glass. The mesh should be not less than one-half inch and the wire not smaller than No. 12.

VI. — Ladders.

A few good ladders for risks, away from fire departments, would be found very useful in fighting fires. These ladders should be kept in easily available places so as to be ready at all times in case of fire.

The safeguards against fire which we have just enumerated are all inexpensive and easily obtained, though they add materially to the safety of the building.

We now turn, however, to the more costly and consequently better defences.

VII. — Standard Fire Doors and Shutters.

The use of fire doors and shutters cannot be too highly commended. Fire doors, if properly made, will stop a fire, or at least will offer a great resistance to the progress of the flames.

Shutters on the exposed windows of buildings are also very valuable additions and contribute greatly to the safety of the risk from fire. They also serve to decrease the rates materially.

In the town of Lynn, Mass., there are a number of large shoe factories. These buildings are supplied with standard fire proof shutters, in all about eight thousand two hundred. These shutters are closed every night. Inspections are made at different times, between ten p.m. and one a.m., on dates unknown to the owners, and the average number found open out of the whole eight thousand two hundred was fourteen. By the observance of this regulation and by the use of automatic sprinklers, these factories are rated at twenty-five cents per one hundred dollars a year on buildings and thirty-five cents on contents for insurance. To illustrate the difference these improvements make in a risk, we may state that a brick shoe factory here, without shutters or sprinklers, pays one dollar and twenty-five cents a one hundred dollars, or one dollar per one hundred dollars more.

Haverhill, another large manufacturing town, has four thousand and twenty-two shutters on its factories. Inspections made at the same hours, however, showed one thousand five hundred and thirty-seven left open. About one-half of the number of factories are sprinkled. Most of the shutters found open were on the unsprinkled risks. As a consequence of this the average rate is forty cents on buildings and fifty cents on the contents.

To show that we are not attaching any fictitious value to these fire shutters, or that the reduction in rate accorded to their use is not justified by facts, we give an illustration, reproduced from The Standard, Boston, of March, 1899.

This photograph was taken after a fire in the Windsor Hotel at Holyoke, Mass., and affords a pointed illustration of the value of standard fire shutters as a fire retardent.

The wall shown is a building adjoining the hotel, the intervening space being about six feet. The hotel fire was a very hot one, and the hotel wall facing the shutter protected building was demolished. The presence of the shutters not only prevented the fire from communicating to and probably destroying the building but prevented all but a very slight loss. The shutters were opened after the fire as shown in the photograph.

These shutters were put in place on the advice of the secretary of the Holyoke local board. The insured, desiring to take advantage of the schedule reduction allowed for their use, equipped the building with standard shutters. The rate was then reduced from one dollar and fifty-eight to sixty-seven cents.

As fire doors and fire shutters are made on the same plan, it naturally follows that the former are equally protective.

We will now give the detailed instructions for the manufacture of these doors, as laid down by the Underwriters' Bureau of New England.

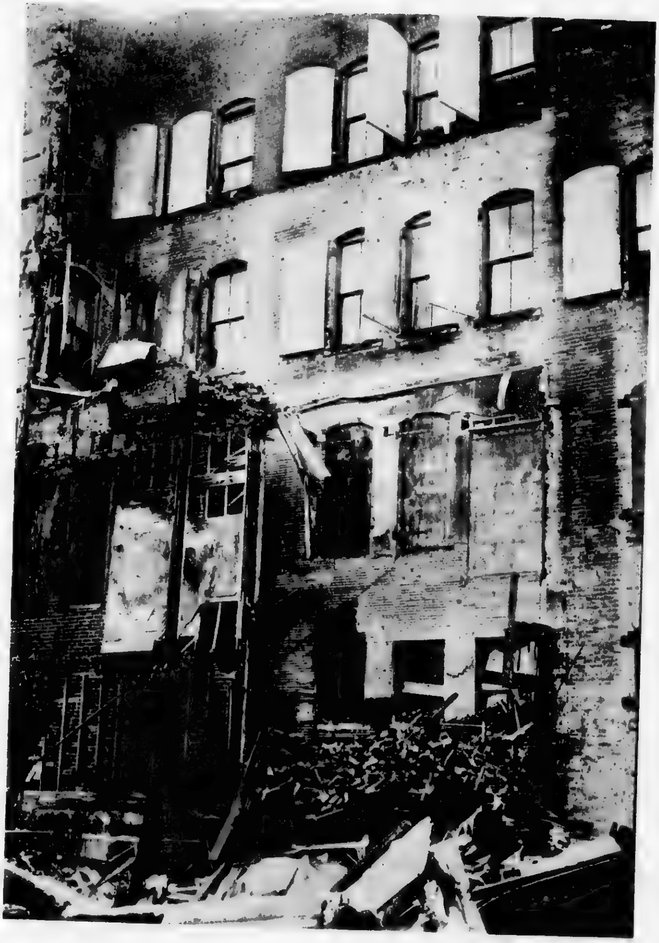
Standard Fire Door — Sliding Pattern.

Sill. — When closed to overlap opening three inches at sides and top, bottom to rest on a non-combustible threshold, preferably a projection of the brick or stone wall to be capped with stone or iron. If a boiler iron plate it should be not less than one-half inch thick and extend under and at least three inches beyond door. When closed door must fit close to wall. It must be balanced by weight and cord.

Thickness. — Thickness of door to be two and one-half inches. (A door two inches thick will be sanctioned in special cases.)

Woodwork to be three thicknesses of seven-eighths inch tongued and grooved soft wood boards, free from sap, not over six inches wide. These to be laid at right angles and each board secured with wrought iron nails driven through and clinched. Top of door to conform with pitch of track.

Covering. — Both sides and edges to be covered with full weight I. C. tin, size of plates fourteen by twenty inches.



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"Bright" finish tin for general use; "leaded" finish where exposed to weather, dampness or corrosive vapors.

Plates to be put together with lock joints and secured to woodwork by one and one-half inch barbed nails. Joints to be turned down over nail heads, leaving no nails exposed.

It is preferable not to paint the tin as it will reflect the heat better. If painted, white or a light coloured paint should be used.

Tinning to be completed before hardware is attached.

A washer to be placed under boltheads which would otherwise rest against the tin. The washers may be dispensed with if acceptable bolts, having broad taper heads, are used.

HARDWARE. — Door to be supported from above. Track to be flat, wrought metal, not smaller than three by three-eighths inches. To be bolted to wall every two and one-half feet or less by three-quarters inch bolts passing through wall and secured by washer and nut. Track to pitch three-quarters inch to the foot.

Hangers to be of heavy wrought metal three by three-eighths inches, attached to doors by bolts.

Wrought metal binder stops, not smaller than three by three-eighths inches; one near top and one near bottom of door, to be bolted to wall in same manner as track.

A roller guide to be located at bottom of door at opposite side from binder stops. Same to have wrought metal upright bolted to wall or floor.

One strip of half inch half round iron to be screwed to door on side next to wall, located one-third the distance from bottom to top of door and parallel to track, ends to be six inches from sides of door.

A counter-sunk flush handle to be placed on side of door next to wall. Best quality bolts to be used in all cases.

AUTOMATIC DEVICE. — Door to be arranged to close automatically, by the fusing of a solder link, this link to be located near the top of opening.

Swinging Pattern.

To have same sill, thickness, woodwork and covering as sliding door. Instead of over-lapping opening, three inches may shut into a three inch rabbet in brick wall. The latter preferred.

Hardware. — Door to be hung by two wrought metal strap hinges, not smaller than two and one-half by three-eighths inches; to be attached to door and walls by bolts passing through and secured by washer and nut. Strap to extend at least two-thirds way across door. Cast iron pin blocks set in brick wall may be used in place of the wrought metal straps bolted through wall, if set in when wall is built; pin to be three-quarters inch in diameter.

Latch to be of wrought metal two by three-eighths inches, at least ten inches long and bolted through door. Catch to be of heavy pattern, bolted to wall.

When the doors are made in two parts the single boarding of one door must extend over that of the other not less than one inch, so as to make a close joint; the half first closed must be bolted top and bottom, and doors must have a bar latch at least twenty inches long.

Standard Shutters — Swinging Pattern.

Thickness to be one and three-quarters inches.

Woodwork to be two thicknesses of seven-eighths inch tongued and grooved soft wood boards free from sap, not over four inches wide. These to be laid crossways and secured with wrought iron clinch nails.

Covering same as fire doors.

Hardware. — Two wrought metal strap hinges for each shutter, size one and three-quarters by five-sixteenths inches. Same to be attached by bolts passed through shutters and secured by washer and nut. A washer to be placed under each bolthead, which would otherwise rest against the tin.

Substantial cast iron pin blocks to be securely set in brick wall to support straps on shutters. Pin to be five-eighths inch in diameter.

Latches and catches to be attached by bolts.

Shutters made in one part to have latch of wrought metal one and one-half by three-eighths inches, at least ten inches long.

Shutters made in two parts to be secured by a wrought metal bar one and one-half by three-eighths inches, and at least sixteen inches long.

Light Weight Shutters for Wood Buildings.

To be a single thickness of seven-eighths inch clear matched boards, securely cleated and covered on edges with lock jointed tin plates.

To be securely hung and fastened.

Shutters for metal-clad wood buildings to be the same, except tin covered both on edges and exposed sides.

Automatic Drop Shutters.

The same regulations as to thickness, woodwork, covering, overlap, binders. Automatic device same as for sliding fire doors.

In General.

Arrange all latches and bars on doors or shutters (except on shutters for wood buildings), to be operated from both sides.

Close all fire doors and shutters, nights, Sundays and holidays, or whenever rooms are not occupied.

Where practicable top of sill at doorway should be two inches or more above level of floor.

An opening between important sections should have a fire door at either side of wall.

We believe the swing pattern door, closing flush into a rabbet in brick wall, to be especially desirable and recommend its use where practicable.

Quite satisfactory automatic closing devices for swinging doors are on the market.

Special constructed iron doors may be advised where subject to excessive corrosive influences and rough usage.

Objectionable Features to be Avoided.

Poor boards for woodwork.

Combustible threshold, even so much as a board top floor extending under door.

Wood lintel, unless overlapped by the fire door.

Hanging door from a wood frame, even if latter is tinned.

Using solder for tinning, even if requirements as to lock jointing and nailing are complied with.

Tacking tin to frame; this is often done in making repairs.

Allowing tin to become unjointed or worn off in places.

Allowing an air space between tin and woodwork.

Attaching with screws any of the hardware, except chafe iron, keeper for latch, handles on sliding door, automatic link, and hardware on shutters for wood buildings.

Allowing doors or shutters to remain open nights and Sundays, even if provided with automatic closing devices.

Use of angle iron track, which is liable to collect refuse preventing the proper closing of the door.

Exposure.

Shutters. — Brick or stone buildings, exposed by outside property, should have standard tin-clad shutters at each exposed window opening.

Exposed doors to be tin-clad.

Exposed wood cornices, if any, to be metal covered.

Wood buildings to have exposed window openings protected by wood shutters, tinned on edges.

Metal-clad wood buildings to have exposed window openings and doorways protected by wood shutters and doors, tinned on outside and edges.

VIII. — Large Stand Pipes, Internal and External.

According to the Universal Schedule, if a building is furnished with internal stand pipes supplied from tank, with hydrants and hose attached at each floor at landings, a deduction of two per

cent. of the rate is allowed. If the stand pipes are not supplied from a tank but are under sufficient pressure to ensure water on the highest floor a deduction of one per cent. of the rate is allowed.

External stand pipes for the use of the fire department and with siamese connections claim a deduction of one per cent. of the rate.

IX.—Automatic Sprinklers.

Automatic sprinklers or fire extinguishers within the last few years have come into very extensive use. They have been installed in leading manufactories, in stores of all kinds and in theatres, and have usually operated, when required in subduing incipient fires, before much damage was done.

Automatic sprinklers consist of a system of piping, attached to the ceilings of rooms and connecting with an ample supply of water. These pipes have at intervals of from six to ten feet, the distributing heads or sprinklers. These sprinklers, which when open will throw water around them in all directions, are kept closed by means of soldered links, graduated to open when the temperature of the room rises above a certain heat. Only the sprinklers thus acted upon open, so that the water damage is confined to the room or place where the fire occurs.

(CLOSED) (OPEN)

Fig. 14. Walworth Automatic Sprinkler.

These sprinklers are of great value as the fire is extinguished by them before it has time to gather headway.

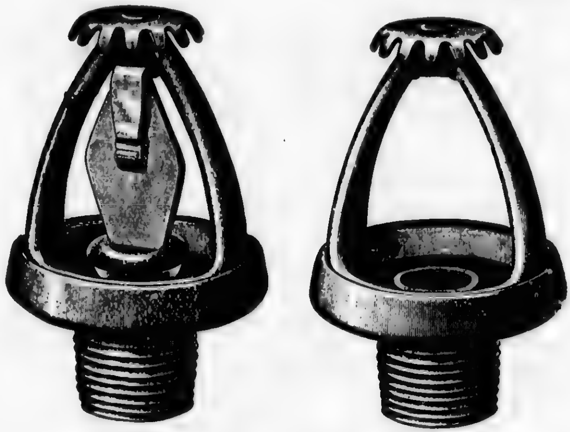


FIG. 15 — GRINNELL GLASS DISC AUTOMATIC SPRINKLER.
Pendant or upright pattern. Actual size.

The cardinal principles, governing the installation of automatic sprinklers and to ensure effective operation, are the following:

1. Building must be open in construction, free from concealed spaces or places where water thrown from sprinklers cannot penetrate.

2. Sprinklers to be so located that their distribution will cover all parts of the premises.

3. Sprinkler piping to be of sufficient capacity and to have water under pressure in same at all times, except in case of buildings where there is danger of water freezing, when the dry pipe system, as described on page 130, can be used.

4. A supply of water of sufficient quantity and pressure available at all times.

All of the above conditions are essential and should be complied with to obtain proper automatic sprinkler protection.

THE LOCATION AND ARRANGEMENT OF SPRINKLERS.

They should be located preferably in an upright position on the top of the pipes. The advantages of arranging them in this way are that the sprinkler and pipe fitting will not collect sediment and they can be entirely drained, while the pipe shields the sprinkler from damage. On the other hand it necessitates a lower position for the piping and care must be taken to have the deflectors a proper distance from the ceiling.

In all cases deflectors must be parallel to ceilings, roofs, or the incline of stairs. The deflectors of sprinklers in the peak of a pitch roof to be horizontal, and they should be some distance from the rafters, not exceeding ten inches.

The distance of deflectors from ceilings or bottom of joists should be about six inches.

Sprinklers to be placed throughout premises, including inside all closets, basements, lofts, elevator wells, and under stairs. Special instructions must be obtained relative to placing sprinklers under large shelves, benches, tables, overhead storage racks and platforms, and inside small enclosures, such as drying and heating boxes, coal boxes, tenter, and dry room enclosures, shutes and cupboards. Also above all shafting and gears, even in wet basements, and in boiler rooms, especially if steam fire pump depends on said boilers for its steam supply. Sprinklers not to be omitted in any room merely because it is damp or wet. It is the province of automatic sprinklers to subdue a fire in its early stages. A fire originating in an unsprinkled section is liable to gain sufficient headway to prevent its being checked by the sprinklers in other portions. It is essential that the equipment be thorough. Cases have been known where fires starting in places protected from the water thrown by sprinklers (as under platforms and in small dry rooms), have continued to burn and caused the opening of all sprinklers in the room, occasioning a discharge of water where not desired and reducing the discharge near the fire.

Each automatic sprinkler should have an unobstructed outlet of such size and form, that with five pounds pressure maintained at the sprinkler, it will discharge approximately twelve gallons

per minute. This is very nearly the discharge through a half inch opening in a thin plate, such as is used in the Grinnell sprinkler, and is a standard for all sprinklers. If smaller than this the danger of clogging from sediment, etc., is increased. A sprinkler with a taper half inch outlet will need a sharp shoulder just within the orifice, similar to a ring nozzle on a play pipe.

Feed Mains and Risers.

The feed mains are the large pipes supplying the water.

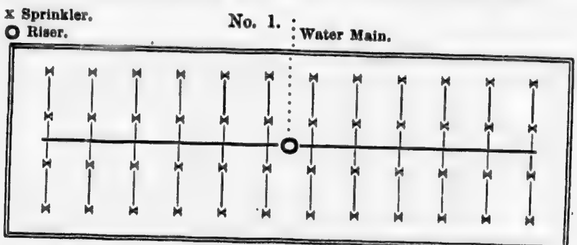
The riser is the pipe running up through the building and from which the smaller sprinkler pipes are supplied. These risers are sometimes as large as six inches in diameter, the size varying according to the number of sprinkler pipes to be filled.

"Centre central" or "side central" feed to sprinklers is recommended. The former is preferred, especially where there are over six sprinklers on a branch line. End feed is not approved.

The object is to place all sprinklers near the larger sized supply pipes, and thus cause the distribution of water from sprinklers to be more uniform. There must be a separate riser in each building and in each section of a building divided by fire walls. The size of each riser to be sufficient to supply all the sprinklers on any one floor, as determined by the standard schedule of pipe sizes. If the conditions warrant special permission will be granted allowing the sprinklers in a fire section of small area to be fed from the riser in another section.

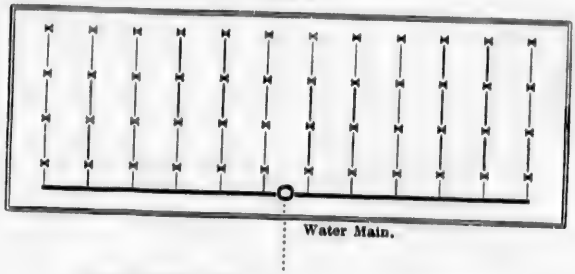
Where there are sprinklers enough in one room to require a six inch riser, according to schedule, it is preferable to have these sprinklers supplied through two or more smaller risers.

No. 1.



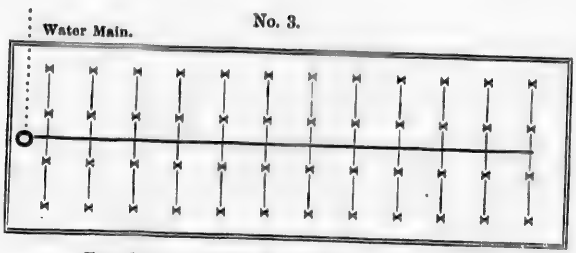
Centre Central Feed to Automatic Sprinklers.

No. 2.



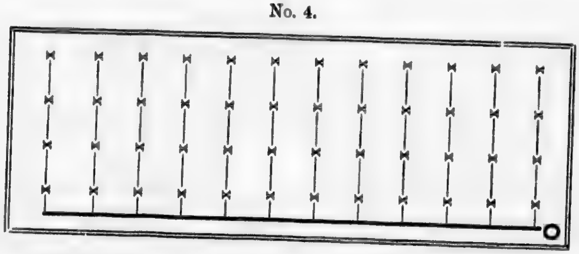
Side Central Feed to Automatic Sprinklers.

No. 3.



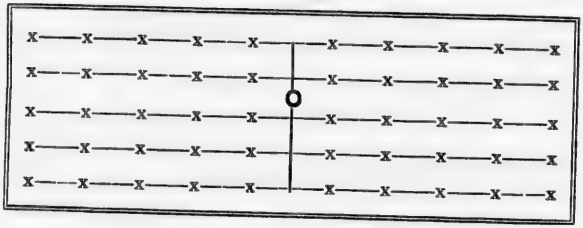
End Central Feed to Automatic Sprinklers.

No. 4.



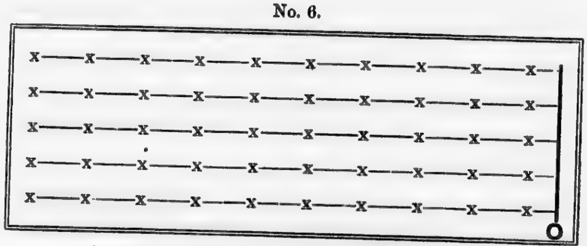
End Side Feed to Automatic Sprinklers. ***(Unapproved).***

No. 5.



ACROSS CENTRE FEED TO AUTOMATIC SPRINKLERS.

No. 6.



ACROSS END FEED. LONG LINES. (*Unapproved*).

A belt, stair, or elevator tower, having floor openings without "shut-offs," is to be treated as one room and pipe sizes arranged accordingly. Sprinklers to be on a separate riser with independent shut-off and drip valves.

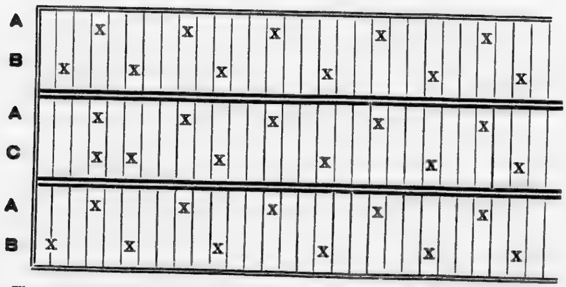
The circulation of water in sprinkler pipes is very objectionable, owing to greatly increased corrosion, deposit of sediment and condensation drip from pipes; for this reason the sprinkler pipes must not be used in any way for domestic service.

SPACING OF SPRINKLERS.

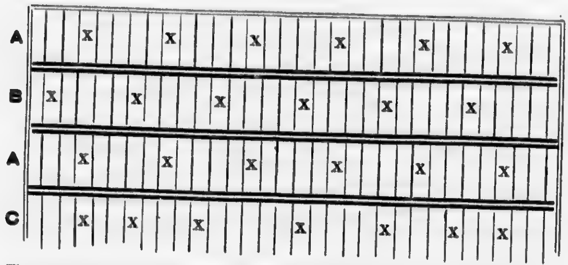
There is no average rule for the spacing of sprinklers, as the spacing is entirely different under joisted and smooth ceiling construction. We may, however, lay down a few general rules which will serve as a guide. Under smooth ceilings, such as plaster, wood sheathing or plank and timber "mill" construction (floors laid on timbers placed from eight to ten feet apart, from centres), the sprinklers must not exceed a distance of ten feet apart in either direction, that is the distance between the heads on the line or the distance between the lines of pipes. Under joist construction sprinklers must not be more than ten feet apart when the pipes are run in the same direction as the joists, or more than eight feet apart when the pipe lines are laid across joists. The distance between the pipe lines, usually, not to exceed ten feet.

The staggering of sprinklers is a positive requirement when they are used under open joist construction. This staggering, as it is called, consists in placing them exactly opposite a point, half way between the sprinklers on the adjacent lines, and can best be shown by the following sketch:

STAGGERED SPACING OF SPRINKLERS.



(The perpendicular lines represent Joists, and the heavy horizontal lines Timbers).



(The perpendicular lines represent Joists, and the heavy horizontal lines Timbers).

Lines A — Sprinklers are placed according to standard, four feet from walls and eight feet apart.

Lines B and C show two methods for staggering sprinklers.

Line B, end sprinklers, are two feet from wall and six feet from next sprinkler on the line.

Line C, end sprinklers, are four feet from the wall and four feet from next sprinkler on the line.

Either arrangement is acceptable.

Size of Pipes.

In no case shall the number of sprinklers, on a given sized pipe, exceed the following:

Size of Pipe.	Maximum Number of Sprinklers Allowed.
¾ inch	1 sprinkler
1 "	2 "
1¼ "	4 "
1½ "	8 "
2 "	16 "
2½ "	28 "
3 "	48 "
3½ "	78 "
4 "	110 "
5 "	150 "
6 "	200 "

This is the New England standard, and systems thus installed have had a wonderful record in the extinguishment of fires. When sprinklers have not worked, the failure in the majority of instances has been due to defective water supply and causes other than those which could be attributed to an error in the size of the pipes.

Some authorities are of the opinion that an arrangement of piping different from the above could be installed at about the same cost and be at least equally efficient and logical. It would do away with five and six inch pipes within a mill, and this saving would balance the added expense of increasing the smaller sized pipes. These changes would result in an equipment, which at any point in a room, either centre, end or side, would allow a much more uniform discharge of water through a number of sprinklers (say forty) that can be secured with the present schedule.

It would seem needless to devise a system with a view of supplying two hundred heads at one time or even one hundred. Water supplies, capable of furnishing the quantity of water which would be consumed by this large number of heads, are rarely available.

The main point about a sprinkler system is to have the first few sprinklers opened as effective as possible, and the way to accomplish this is to increase the size of the smaller pipes.

A further regulation, governing the installation of sprinklers, is the following:

Not more than six sprinklers to be placed on one branch line of pipe, except in compliance with the table given below. (A branch line, we may state, is the extreme length of pipe on a sprinkler system in any direction).

This rule, limiting the number of sprinklers, is intended to bring all sprinklers near the larger sized supply pipes, thus avoiding the excessive friction loss in long lengths of small sized pipes.

Size of Pipe.	Maximum Number of Sprinklers Allowed.
¾ inch	1 sprinkler
1 "	2 "
1¼ "	4 "

$1\frac{1}{2}$ inch	 6	sprinklers
2 "	 8	"
$2\frac{1}{2}$ "	16	"
3 "	28	"

Dry Pipe System.

Where buildings or portions of same are so constructed, or where the nature of the occupancy is such that the premises cannot be sufficiently warm to prevent the water in the sprinkler pipes from freezing, the ordinary wet pipe systems cannot be used, and a valve (called a dry valve) is introduced in order to keep the water out of the pipes. The sprinkler pipes are then filled with air under pressure. The reduction of this pressure, owing to the opening of a sprinkler, allows the water pressure to automatically open the dry valve, when the water fills the system and is distributed from the open sprinkler.

The ordinary working air pressure in dry pipe systems should not be less than twenty pounds, and for pressure above this it should be about one-third as great a pressure as that of the water supply, under or restrained by the dry pipe valve.

A dry pipe system, however, is not recommended when a wet pipe system can be used. In addition to the possibilities of failure in a wet pipe system, such as the failure of sprinklers, or of the water supply, or the stopping of the pipes by a closed valve: there is also in the dry pipe system another element of uncertainty in the use of a dry valve. Besides this there is of course some delay in the distribution of the water.

The use of an approved dry valve is far preferable to shutting off the water entirely during cold weather. In New England the latter practice is not sanctioned.

The sprinklers must be located in an upright position and especial care taken to arrange all sprinkler pipes and fittings that they may be thoroughly drained. In this connection it must be remembered that a dry pipe system cannot be drained completely at once. Employees in charge of sprinklers must drain the dry system daily until completely emptied.

The pipes must be supported in a substantial manner by wrought or cast iron hangers. Hoop iron, chains, or supports of combustible material are not allowed.

Water Supply for Sprinklers.

Two independent water supplies are absolutely essential for the best equipment. At least one of the supplies must be automatic and one should be capable of furnishing water under heavy pressure. The following are considered adequate and are accepted by insurance exchanges and boards:

Public water works system, duplex steam pump, private reservoir, or stand pipe, elevated gravity tank, air pressure tank, rotary pump. The choice of water supply to be determined by the underwriters having jurisdiction. Two supplies are essential; more than two are often desirable. The primary supply should furnish water under heavy pressure, so that the first sprinklers opened may be thoroughly effective.

A desirable combination for a country risk is a pressure tank, gravity tank and pump. For city risks, pressure tank and public water works.

Approved Automatic Sprinklers.

"Grinnell" (old and new pattern).

"Hill."

"Kane."

"Neracher." Head to be placed upright. The top of sprinkler piping to be six inches below the ceiling in mill constructed buildings (that is free from joists), and six inches below the joists in mill constructed buildings.

The General Fire Extinguisher Company, No. 173 Devonshire Street, Boston, Mass., control the above.

"Mackey" (1889 or "non-corrosive head").

The Manufacturers Automatic Sprinkler Company, Syracuse, New York.

"Newton," R. W. Newton, Providence, R. I.

"Walworth," Walworth Manufacturing Company, No. 16 Oliver Street, Boston, Mass.

"Esty," Esty Sprinkler Company, Laconia, N. H.

As it is not a simple matter to install properly a sprinkler system, we strongly recommend to any who contemplate availing themselves of this additional safeguard against fire that they give the contract to those experienced in the work and not to a local piper, plumber or irresponsible steam fitter. The latter course is liable to make the cost unduly high, owing to mistakes which will have to be corrected, and will probably leave the equipment an eyesore and source of anxiety to the owner and a subject of criticism by inspectors.

X. — Basement and Sub-Cellar Sprinklers.

In consideration of the fact that fires are most likely to start in basements and sub-cellars, where rubbish accumulates, and also that fires in these places are often difficult for the firemen to reach, it would be a great improvement to many risks to have such places thoroughly equipped with a system of automatic sprinklers. This would not be nearly so expensive as piping all the premises, and would at the same time be a valuable addition to the fire preventive facilities of the building. But it is best, of course, if possible, to have the sprinkler system installed throughout.

XI. — Thermostats.

In addition to the sprinkler system many risks in the United States are now furnished with automatic fire alarms, known as thermostats. This system consists of electric wiring on the ceilings of all rooms. A circuit closer, known as the thermostat, is placed in the system at frequent intervals, generally not exceeding fifteen feet. The heat of a fire operates the thermostat, which makes a connection in the wire and rings an alarm by means of the electric current.

These thermostats are usually located wherever automatic sprinklers are placed, and also in detached sheds, porches, etc.

With a few changes and improvements made in this system there is no reason why it should not be superior to the watchman and clock for a majority of risks.

Thermostats can either be installed as a separate system or in combination with the sprinkler equipment. If the latter is used the White combination thermostat and Grinnell automatic sprinkler is considered one of the best.

Lastly, in closing this article on sprinklers, and in reply to the contention that they are usually ineffective on account of failure of the water supply, or from the pipes, and sprinklers clogging, or from various other causes, we quote the following from the hand book of the Underwriters' Bureau of New England:

"According to data supplied it appears that out of a total of 1,271 fires 95.76 per cent. were reported as well controlled by sprinklers, 3.30 per cent. resulted in serious loss, owing to defective equipments or damage from exposures, and .94 per cent. are not classified, owing to insufficient information."

Or, instead of general statements and figures, to give a specific instance, out of many available, we might quote the following from a report "on light wells and other vertical hazards as found in department stores," written by E. W. Crosby, manager of the Underwriters' Bureau of New England:

"We have knowledge of over twenty fires in department stores, controlled by automatic sprinklers. These have almost invariably occurred in the night, and many of them in places remote from vertical openings, as in brick waste paper bins, boiler rooms, etc. One fire, however, is noteworthy in this connection; viz., that of Bloomingdale Brothers, New York, occurring at one o'clock in the morning, December 17, 1898, and warrants extended comment.

The section in which the fire started is nearly all taken up by a large light well forty by thirty-five feet, extending from the first floor to the roof and with a heavy glass skylight at the top. The entire premises are equipped with a system of Grinnell glass disc sprinklers supplied by five pressure tanks, containing fifteen thousand gallons of water when two-thirds full and under seventy pounds pressure at tanks, giving about ninety-five to one hundred and fifteen pounds at sprinklers in the building in which fire occurred. There were also six gravity tanks of about fifty thousand gallons total capacity. This exceptionally powerful

water supply had been installed a few months previously under specifications of the New York Board of Fire Underwriters.

In the centre of the light well, referred to, a platform about eight feet square and ten feet high had been built on the first floor, and on this stood a Christmas tree, forty to fifty feet high, decorated with the customary trinkets, etc., while from the tree to the iron columns at the different floors extended streamers of evergreen.

It was inferred, from the marks of the smoke, that the fire started somewhere between the first and second floors, and opened two sprinklers on the first floor, four on the second, ten on the third and one out of twelve at the top of the light well, or seventeen in all. The sprinklers checked the fire and the department extinguished it.

Now we would call attention to the following facts: The fire spread rapidly, due to the Christmas tree, its decorations and the large open draught space. There was little open stock on the three floors in the vicinity of the well to which fire could communicate; galleries being used for passageways, having curtain walls on three sides and restaurant on part of fourth side. Therefore, as the tree and its decorations constituted the only fire and were quickly consumed, the sprinklers had an excellent opportunity. The heat in rising spread into the different flats, opening on successive floors two, four and ten heads. Under the skylight there were eleven high test 286° F. sprinklers, and by mistake one ordinary 160° F. sprinkler. Only the latter opened.

The glass on the skylight was not cracked and little of the paint on the interior of the well was blistered. These conditions, spreading fire and smoke at once to three different floors, would have endangered hundreds of lives had the fire occurred twelve hours earlier, and this is the thought of chief importance. But the fire annihilating energy of automatic sprinklers, under seventy-five to one hundred pounds pressure sustained, no matter whether one or many heads be open, should be witnessed to be appreciated.

In the well equipped sprinkler system in large department stores is the greatest power for extinguishing fires; for when the

smoke is thick and men stand back, when the hose jet pierces the window only to be scattered by the first obstruction, the sprinklers, far within the building, are quietly surrounding the fire and holding it in check."

We think these facts fully answer any arguments adverse to sprinkler equipment as a fire preventive.

XII. — Watchman and Clock.

A watchman and watch clock are valuable additions to a risk.

If the night watchman is trustworthy and does not neglect his duty this precaution ensures a careful guardianship of valuable property during the dark hours.

The rules given for watchman's service are as follows:

An approved clock to be provided, and stations so located as to necessitate the watchman visiting all sections of the premises. The rounds should be made at least once an hour during the night, dating from the time the mill shuts down until it starts again next morning.

Recorded rounds should be made at least once every other hour during the day when the plant is not in operation, as upon Sundays and holidays.

The value of this protection, as recognized by insurance men, may be estimated from the fact that the building schedule of the Universal Rating Schedule of the United States allows five per cent. of the rate off for a watchman, and a deduction of ten per cent. of the rate for a watchman and watch clock, or electric detector.

We may mention, for the benefit of those who are not familiar with watch clocks, that they are devices for ensuring that the watchman visits each section of the premises at the required hours, and also for registering the time at which he passes through. It is in effect a check on the watchman's movements.

XIII. — The making accessible or doing away with Roof Spaces, Blind Attics, and Cock Lofts.

The objection to roof spaces, blind attics, and cock lofts is that a fire once getting into such places is not easily discovered and is seldom extinguished.

These places are usually very difficult to get at in order to extinguish a fire, once started there. There may or may not be a small man-hole leading into it, and perhaps a ladder, or more than likely the ladder is gone. In all probability the only way to reach a fire in a place of this nature is to erect the ladder and make a hole in the roof or side of the building, then play through this with the hose. Of course this admits the air, giving more impetus to the fire within, and the opening must be made large, so that the firemen can use the nozzle effectually and reach the right place. While all this is being done the fire gains headway rapidly.

Again in a roof space a fire can obtain a good start because there is no means of detecting it at once.

The chimney may sag or settle, and open cracks through which sparks may issue, or a fire may start in any way, but all this is unknown to the occupants below until the crackling and roaring of the flames, or the smoke filling the house announces the danger; usually too late to prevent heavy loss. If, however, these places were done away with the damage to the chimney or the commencement of a fire could be seen at once. Nor are the dangers of its isolation and inaccessibility, or its veiling of fires the only objection to this form of construction. The roof space is cut off from the rest of the building, dust accumulates (and dry dust in quantities is dangerous) the chimneys, and perhaps some hot air, hot water, or steam pipes run through it, heating and drying the atmosphere, making the dust dry and inflammable, and not only the dust but all the woodwork. Added to the dust are rats and mice. These creatures often build their nests, preferably in a warm place, near a hot pipe or by a chimney. They use all manner of rubbish — string, straw, wool; nests have been seen near a hot pipe with matches worked in them, threatening fire at any time; the creatures use anything almost, and it might happen that all the elements of spontaneous combustion are ready in the nest, and these would be aided by the heat of the pipe or chimney.

The objection to these places is further increased if the elevator shaft, or ventilating or other shafts, or staircase openings communicate with them, making air drafts, and aiding the spread of

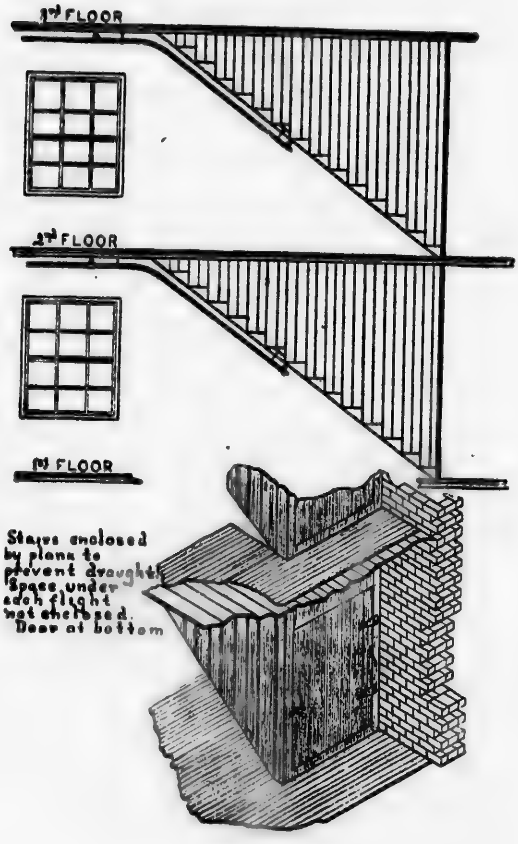
the flames. In these circumstances a fire in the lower stories of a building would rapidly gain the most inaccessible portion. Or, on the other hand, a fire starting in the roof space can quickly cause fire in the lower stories by burning embers dropping down these shafts. This fault can be corrected at a small expense, either by breaking the connection, if an elevator shaft or stairway opening, by means of closing hatches, or, if a ventilating shaft, by leading it to the air through some other place. The best roof is a flat metal one without any roof space, blind attic, or cock loft. We would recommend for all new buildings that there be no spaces of this kind allowed, and for all buildings which already possess these objectionable features that they be done away with, if possible, and at least that no elevator shaft, ventilating or other shafts, or stairway openings be allowed to communicate with them unless proper cut offs are provided, and lastly, if nothing else is done, that these places are made readily accessible, in case of fire, by means of trap doors and ladders.

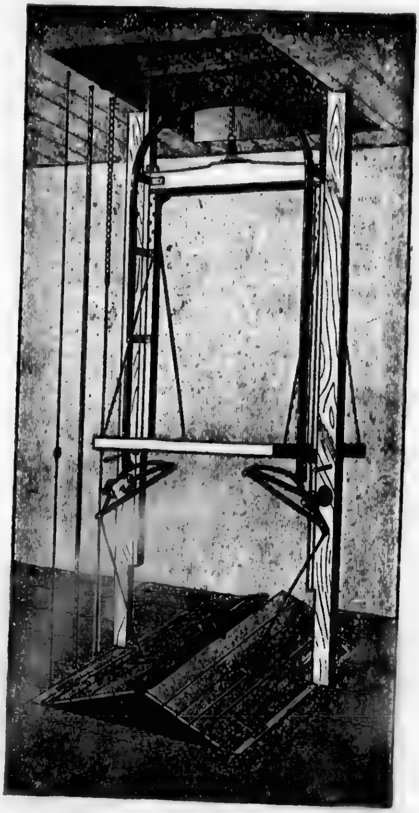
XIV — Elevators in Fire Proof or Fire Resisting Shafts, and with Self-Closing, Fire Resisting Hatchways — Light Wells and other Vertical Hazards.

There is nothing so weakens the fire resisting properties of a building as unprotected openings from cellar to roof, such as unenclosed stairways, open elevator shafts, well holes, hatchways, wooden chutes, dumb waiters, ventilating shafts and belt holes. They ensure the rapid progress of fire throughout the structure, on the same principle that a stove pipe promotes combustion in a stove, and there is no excuse for such faults in mercantile buildings. Even when enclosed in ordinary lath and plaster partitions, with wooden doors at each floor, combustion may be retarded sufficiently to enable the fire department to arrive in time to save the building. Every minute gained in retarding its progress, after a fire starts, increases the probability of its extinction. From this point of view it is a grave question, if the protection of these communications from floor to floor be not more important than the structural composition of the floors themselves.

It is possible to protect an elevator shaft, even after the erection of a building, by metallic lath and plaster.

In the works of authorities on fire insurance we find many recommendations in relation to these important features — from a fire insurance standpoint — of building construction.





AUTOMATIC TRAPS FOR ELEVATOR FLOOR OPENINGS.
Manufactured by Morse, Williams & Co., D. B. Maclary, Manager,
19 Pearl Street, Boston, Mass.
There is no enclosed weight box through which fire can spread.
Traps to be tinned on lower side and edges.

The requirements for stairways and elevators in a standard mill building, for instance, are that they be located in brick or stone towers. Communication between the towers and adjoining build ings to be protected by standard fire doors.

Stairways in a wood frame building to be located either in a wood tower or the mill proper and to be enclosed with one and one-half inch plank, or fire proof partition at each flight with a door at the bottom. The elevator well to have automatic hatches or traps at each floor opening.

Elevators and stairways when not in towers should be located at a side wall, instead of in the centre of the room.

Elevator shafts should not be lined with wood, or if so constructed there should be a covering of tin or galvanized iron.

The bottom of the shaft should not be used for closets, and especially not for lamp and oil closets. If the building is sprinkled there should be sprinklers in elevator wells and under stairways.

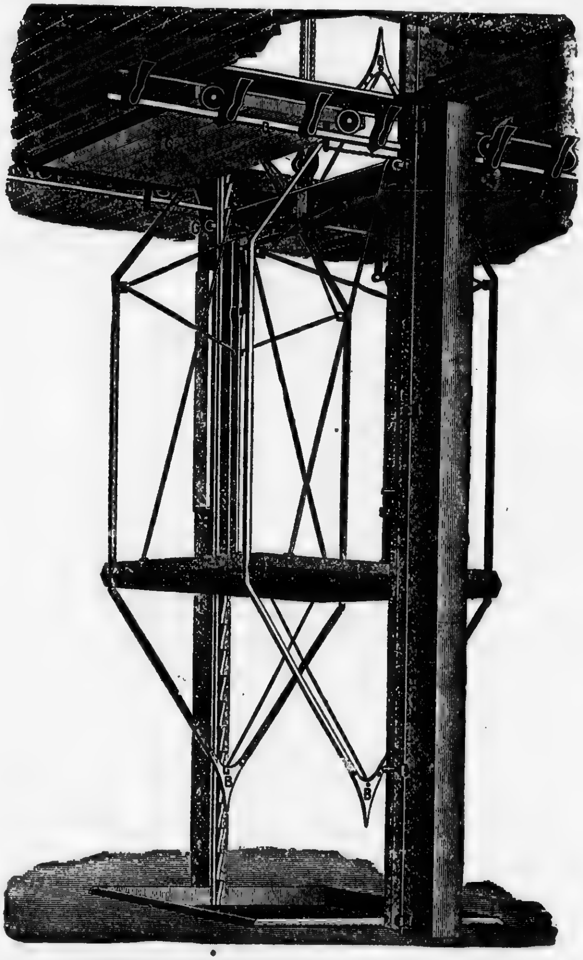
The safest rule for elevators and staircases is that they be located in fire proof or fire resisting shafts, or in hallways cut off from the main structure by brick walls with self-closing fire doors at each story. Where elevators and staircases are not cut off by brick walls they may be cut off at a small expense, as we have before stated, by metallic lath and plaster partitions, or by partitions of patent plaster blocks.

Dumb waiters, ventilating shafts, and all openings from floor to floor throughout buildings, if necessary (and they seldom are), should be of fire resisting material throughout; at best they are likely to serve as flues and convey fires throughout the structure.

Wooden chutes, wooden dumb waiters, shafts, etc., are inexcusable, and well holes and hatchways, while frequently found in mercantile buildings, ought not to be allowed anywhere.

The hazard of well holes and hatchways can be considerably reduced by providing them with self-closing traps.

In order to show that the danger attaching to vertical openings, such as those with which we are dealing at present, is not an imaginary one we give herewith a list of ten fires, which we have taken out of E. U. Crosby's article on light wells and other vertical hazards, as found in department stores:



Automatic Hatches for Elevator Floor Openings.
Manufactured by Holyoke Machine Company, Holyoke, Mass.
To be tinned on lower side and edges.

Siegel, Cooper & Co., Chicago, Ill. — Burned about eight years ago. An old building of ordinary construction, having open stairways, elevator shafts, etc., through which the fire had a clean sweep, resulting in a total loss in less than an hour. Value approximately $300,000. Fire was on all floors within eight minutes of its discovery.

Famous Shoe and Clothing Company, St. Louis. — Fire of December 8, 1892. Originated in show window, trimmed with cotton. Caused by engineer's lighted alcohol torch while putting in electric wires. Spread of fire very rapid, destroying contents of window, extending to the store, and communicating with large light shaft in centre of store. Only the most prompt action of automatic alarm and fire department prevented a complete destruction. Loss $35,000.

Barnes, Hengerrer & Company, Buffalo, N.Y.—Fire of about twelve years ago. The quick destruction of building and contents was attributable to the fact that entire first floor was filled with light fabrics displayed on racks, etc. Of course, as the elevator and stairways were not protected the fire quickly spread to the upper stories.

Dunlop Building, Columbus, Ohio. — On the night of February 1, 1899, fire started in the basement, near the elevator shaft. The elevator was open, thus acting as a flue, and causing the flames to reach almost instantly the upper stories of the building, even before the department could respond. The building was destroyed. Fire spread to buildings adjoining on the south, and also damaged the Green Joyce building to the extent of about $10,000 ; stock therein to the amount of $171,000.

Rust Building, Columbus, Ohio. — Fire of February 1, 1898, was caused by explosion of drugs in drug department. Fire spread through elevator, light and stair shafts. Building was of fire proof construction, insured for $25,000. Loss about $21,000. Insurance on department store tenants must have been $125,000, on which there was a large loss paid.

Thomas H. Groves Building, Columbus, Ohio. — Fire of July 2, 1898. In this building of ordinary construction fire spread through light wells, accomplishing a loss of $34,000 on $50,000 insurance.

J. L. Hudson Clothing Company, Columbus, Ohio. — Fire of December 23, 1897. — In this building of slow burning construction fire communicated through a large light well from a building adjoining. Loss $102,000. This fire is a good illustration of the rapid spread of flames on account of vertical openings.

C. Ross Company, Ltd., Ottawa, Canada. — Burned out December 3, 1896. Fire originated in basement of building containing a light well, which acted as an agent, conducting fire to the top and every flat

simultaneously, which then leaped the fire wall of adjoining building, burning the building from top to bottom, which, in like manner, leaped the fire wall of the Ross Company building, gaining entrance through a skylight in their roof, and burning building from top to bottom. If the Ross building had not had a skylight in their roof the chances are it could have been saved. Total loss in round numbers was $300,000.

The Robert Simpson Company, Toronto, Canada.—March, 1895. Building was a substantial six story brick structure. Before the fire brigade arrived upon the scene the fire had spread from basement to the top flat, no doubt due to the open well running straight up through the building. Total loss $350,000. The rapid spread of fire was clearly due to vertical openings.

John Eaton Company, Toronto, Ontario.—May 20, 1897. Fire was burning on every floor, due to vertical openings, before the brigade arrived. Loss was total, $325,000.

All of the above mentioned Toronto stores had large open wells up through the centre of the building, open hoists and open stairways, which contributed to the rapid spread of the fires and making a total loss in each case.

Some of the conclusions arrived at by Mr. Crosby are as follows:

(a). There should be no light well.

(The loss of illumination due to the abandonment of the light well can be more than made up by a proper use of the wonderful Luxfer prism glass in wall windows, aided, in especially deep or angular buildings, by the modern artificial white lights).

(b). Where such a well is allowed to exist it should be shut off from communication with each story by "wire" or "prism" glass partitions, set in non-combustible frames permanently secured in position. First story to be shut off from well by a similar horizontal partition at ceiling level.

(c). So long as light wells are allowed to remain in violation of (a) and (b) above they should not be used for display of goods or of any inflammable decorations. No temporary structures should be allowed therein. Where an exception is made

for the display of goods on first floor counters, automatic sprinklers should be placed directly over said goods on level with ceiling of first story. These can be fitted in a decorative manner to brass pipes, and are in addition to the sprinklers otherwise called for in wells by the sprinkler regulations.

(d). Stairs and elevators should be in brick shafts, with spacious entryway on each floor within each shaft. A standard slide fire door should be hung at shaft side of each opening into entryway.

These conclusions of Mr. Crosby's, it must be remembered, are in connection with the large department stores, as found in the United States.

For risks in the Maritime Provinces, containing any of the hazardous features we have enumerated above, the suggestions we have given, if adopted, would serve to reduce materially, if not to eliminate the danger, and we would urge the adoption of such improvements wherever possible.

SPONTANEOUS COMBUSTION.

The subject of this article is of extreme importance, not only because it may occasion great destruction of life and property, but also because it may lead to unjust charges of incendiarism.

Spontaneous combustion, in fact, is one of the most subtle and secret enemies that the underwriter has to cope with. It is the cause of a large proportion of accidental fires and not a few of those justly originating in incendiarism. Under certain conditions numerous articles of commerce are liable to generate heat enough to induce flame, either spontaneously or by contact with inflammable materials, and cause consequent destruction. The improper mingling or want of due care in storing certain kinds of goods is a frequent cause of spontaneous combustion.

Although spontaneous combustion is now a well known and recognised feature in the business of fire insurance, yet for the benefit of those who have not studied it we may briefly state in this article its origin and the substances which are liable to this peculiar action.

It is then a phenomenon that occasionally manifests itself in mineral and organic substances.

Combustion in any form is a chemical process. In the case of ordinary fire it consists of a union of the carbon in the wood or coal with the oxygen of the air; but whatever the form there is always some resulting heat. The union of oxygen with other substances is called oxidation, and one of the most common forms is the rusting of iron. This action results in the formation of iron oxide, which is common iron rust. It has been found by experiment that the temperature of iron actually rises as soon as rusting begins, but, of course, the process is so slow that it is hardly appreciable by ordinary instruments.

If a roll of greasy rags or cotton waste be allowed to stand oxidation begins; the temperature of the heap rises until finally the pile bursts into flame. This is spontaneous combustion, and hundreds of fires involving loss of life and many thousands of dollars worth of property have started in this simple way.

But oily waste is far from being the only substance liable to spontaneous combustion. Fine dry dust of almost any kind will explode from this same cause, and many a paper mill has been burned from the fact that the rafters and beams have gradually become covered with a fine dry dust or powder.

Frequently flour mills share this same fate and accumulations of dry flour or dust have to be guarded against most carefully.

It is a very easy matter to test this property of powdered substances, for if we pour the dry pollen of a flower over a flame there is an immediate explosion, while even iron filings will burn like gunpowder.

Ordinary charcoal does not undergo combustion in air, under a temperature of one thousand degrees, but in some states it is liable spontaneously to acquire a temperature which may lead to unexpected combustion. Thus lampblack, impregnated with oils, which contain a large proportion of hydrogen, gradually becomes warm and inflames spontaneously.

According to M. Aubert, Chevallier, and other French observers, recently made, charcoal in a state of fine division is liable to be spontaneously ignited without the agency of oil. There have been many instances of the spontaneous ignition of coals, containing iron pyrites, when moistened with water. The pyrites, which most readily give rise to spontaneous combustion are those in which the proto-sulphide is associated with the bi-sulphide of iron. Sulphur has no tendency to spontaneous combustion, but Dr. Taylor in his "Principles and Practice of Medical Jurisprudence" refers to an instance that came to his own knowledge, in which there was reason to believe that the vapour of bi-sulphide of carbon in an india rubber factory was ignited by solar heat traversing glass. Phosphorus, when in a dry state, has a great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under seventy degrees.

From these cases, occurring in the mineral kingdom, we pass to the consideration of spontaneous combustion in organic substances. Passing over the accidents that may result from the admixtures of strong nitric or sulphuric acid with wool, straw or certain essential oils, and which if they occur are immediate and obvious, we have to consider the cases in which without contact with any energetical chemical compounds, certain substances such as hay, cotton, and woody fibre generally, including tow, flax, hemp, jute, rags, leaves, spent tan, paper waste, cocoanut, fibre, straw in manure heaps, etc., when stacked in large quantities, in a damp place, undergo a process of heating from simple oxidation (*eremacausis*) or fermentation, and after a time may pass into a state of spontaneous combustion. There is undoubted evidence that hay and cotton in a damp state will occasionally take fire without any external source of ignition.

Cotton impregnated with oil, when collected in a large quantity, is especially liable to ignite spontaneously; and the accumulation of cotton waste, used in wiping lamps and the oiled surfaces of machinery, has more than once given rise to accidents, and led to unfounded charges of incendiarism. Livery stables are therefore liable to burn from spontaneous combustion, on account of the greasy rags used in the oiling of harness.

Dr. Taylor relates a case in which a fire took place in a shop, by reason of a quantity of oil having been spilled on dry sawdust.

According to Chevallier vegetables boiled in oil furnish a residue which is liable to spontaneous ignition, and the same chemist observes that all kinds of woollen articles, imbued with oil and collected in a heap, and hemp, tow, and flax when similarly treated, may ignite spontaneously.

Dr. Taylor also states, that although there are no cases recorded it is nevertheless probable, that jute, cocoanut fibre, and linen, and cotton rags imbued with oil, might undergo this change.

But it is still an open question whether such organic nitrogeneous matters, as damp grain or seeds of any kind, ever undergo spontaneous combustion.

A good regulation for greasy rags and dirty waste or other like sources of spontaneous combustion is, that iron pails be pro-

vided to put such latent incendiaries in, and that these pails be emptied and cleansed daily.

"Greasy rags," says Griswold, "iron borings in which oil has been dropped, oiled clothing, cotton waste, woollen waste, newly varnished harness, fine coal in quantities, and powdered charcoal, will all ignite spontaneously in certain circumstances."

Sawdust spittoons, or sawdust on the floors, are prolific causes of fire. White sand is not only safe but cleaner. Cigarette or cigar stumps, thrown into sawdust spittoons, cause numerous fires.

Sawdust, when saturated with oily substances, is liable to burn spontaneously. The danger is not merely while on the floor but is especially great after it has been swept up and placed in a barrel, or where it can overheat in the cellar.

There is also a great hazard in shoddy stuff; old cloth, old carpets, old rope and all other similar stuff, may have all the elements of spontaneous combustion, as they are usually filled with grit, oil, and such ingredients that go to make up the numerous fires in risks where these things are handled, and the causes of which are invariably reported as unknown, but which are undoubtedly occasioned by spontaneous combustion.

The Monitor quotes a list of fires, caused by spontaneous combustion in the following substances, viz.:

Coal.
Heap of rubbish.
Barrel of rubbish and oil-soaked rags used in polishing brass fixtures.
Paper and rags.
A pile of old rubbish in a carpenter and paint shop.
Rubbish in an attic.
A lot of material in a picture-frame establishment.
Basement filled with boxes, barrels, etc.
Waste in picker room of a textile mill.
Old waste in an engine room.
Oily waste in a store room.
In the material in a paint factory.
Waste and varnishes.
Wool bags in the drying room of a woollen mill.
Cotton in drying room.
A fertilizer establishment.

According to the Chronicle Tables the following risks are especially liable to spontaneous combustion, and should be carefully inspected to guard against loss from this cause:

Agricultural implement factories,	18⅓	per cent.
Agricultural implement and seed stores,	16	"
Bookbinding and blank book factories,	20	"
Button factories,	18	"
Carriage and waggon factories,	22½	"
Coal and wood yards,	43⅓	"
Coffee, chocolate, and spice mills,	12¼	"
Cotton goods factories,	12½	"
Cotton warehouses and storehouses,	16	"
Drug and chemical works,	20	"
Drug and chemical stores (retail)	20	"
Dyeing, bleaching, and cloth-finishing establishment,	17	"
Fertilizer and phosphate works,	27¼	"
Flour, grist and oatmeal mills,	15	"
Furniture and undertakers' stores,	17¼	"
Furniture and upholstery factories,	27	"
Grain elevator and storehouses,	13¼	"
Harness and saddlery factories,	16	"
Hat, cap, and materials' factories,	15¼	"
Malt houses,	19¼	"
Paint, varnish, and oil stores,	37	"
Painters, glaziers, and paper hangers' shops,	39	"
Photograph galleries,	15	"
Paper and pulp mills,	29	"
Picture and mirror-frame factories,	26	"
Printing and lithographing establishments,	20	"
Railroad car and repair shops and roundhouses,	22	"
Railroad stables,	23	"
Rubber factories (vulcanized goods, etc.)	41	"
Tanneries,	14	"
Warehouses and storehouses (waste, rag, paper, etc.),	64	"
Warehouses and storehouses (paint, oil, and varnish),	26	"
Warehouses and storehouses (general),	21¼	"
White lead, paint, and varnish factories,	16½	"
Wharves,	22	"
Wood turning and carving shops,	16	"
Woollen mills,	24	"
Worsted and yarn mills,	26	"

The following substances, separately or in conjunction with others as stated, or when stacked in large quantities in a damp state are liable to spontaneous combustion:

Cotton and cotton waste. Cotton especially so, when stacked in large quantities in a damp state.

Coal, especially fine coal.

Cocoanut fibre when stacked in large quantities in a damp state.

Powdered charcoal.
Fine dry dust of almost any kind.
Flax in large quantities in a damp state.
Flax in a heap and imbued with oil.
Wet hay.
Hemp in large quantities in a damp state, and hemp in a heap imbued with oil.
Iron borings in which oil has been dropped.
Jute in large quantities in a damp state.
Lampblack and oil.
Leaves in large quantities in a damp state.
Newly varnished harness.
Old cloth, old carpets, old rope. Such stuff being filled with grit, oil, and such ingredients, doubtless, contains all the elements necessary for spontaneous combustion.
Oily waste.
Oiled clothing.
Paper waste in large quantities in a damp state.
Phosphorus.
Greasy rags.
Rags in quantities in a damp state.
Piles of rubbish.
Sawdust saturated with oily substances.
Spent tan in large quantities in a damp state.
Straw in manure heaps in a damp state.
Tow in large quantities in a damp state.
Tow in a heap and imbued with oil.
Vegetables boiled in oil furnish a residue which is liable to spontaneous combustion.
Woollen waste.
Woody fibre generally, in large quantities in a damp state.
All kinds of woollen articles collected in a heap and imbued with oil.

Griswold lays down the following rulings in regard to spontaneous combustion.

By Proper Vice.

Proper vice is presumed to proceed from the thing itself when it is of a nature to spoil or perish. Thus deteriorations, diminutions and losses that happen through the proper vice of the thing shall not fall upon the insurer.

Underwriters undertake to make indemnity only for damage arising from external accidents, not from that occasioned by the inherent qualities or natural defects of the thing insured; hence, as a general principle, insurers are not liable for the loss of a thing which is consumed by reason of its own qualities, such as spontaneous combustion without external causes, but they are liable for the consequent loss of other subjects covered by the policy.

It has been held that if hemp put on board a vessel in a state liable to effervesce, did effervesce and generate fire the insured cannot recover for loss on the hemp, though a policy on the vessel would be liable.

Also: If a hay rick take fire from heat or fermentation, it is not a loss, except as to adjoining bodies which may be ignited by it. But not if wet on being stacked.

If lime, accidentally submitted to the action of water, take fire it is not a loss by fire as to itself, but it is if, in slaking, it communicates fire to adjoining bodies. But on the other hand it has been held that an insurance against fire, effected upon a quantity of coal, covers also the risk from spontaneous combustion of such coal caused by contact with water in the hold of the vessel; water being the exciting cause, and one of the perils insured against. So with lime put on board dry, and from leakage or other cause generates fire, it would be a loss from fire.

In this connection we have thought it well to give also the relative flashing points and inflammability of dangerous liquids. This list was recently published in the *Gewerbeblatt*, Wurtemburg, and was compiled by Dr. F. Gantter, of Heilbronn, a chemist of some note:

"These data were ascertained by careful experiments for the benefit and aid of German insurance companies in fixing tariffs of rates for fire insurance. As the technical work of German chemists is usually thorough, the information may be considered reliable. We give here the table—altering Centigrade to Fahrenheit—and simply state that ethyl-ether is placed first, as most dangerous, and called 100, or highest risk, along with two other liquids; and every five degrees C. (or nine degrees F.), marks one degree of less relative danger as per third column.

"So ethyl-ether, the highest jeopardy, flashes at four degrees below zero F., while naphthaline, the least jeopardy shown, flashes at 392° above zero F. There are twenty-four degrees of jeopardy among the twenty-six liquids.

	Flashing Point of Vapor of Liquid, F.	Inflammation Point of Liquid, F.	Relative Degree of Danger.
Ethyl-ether (commercial)	—4.0	—4.0	100.0
Carbon di-sulphide	—4.0	—4.0	100.0
Petroleum-ether (sp. gr., .70)	—4.0	—4.0	100.0
Benzole from coal tar (strength, 90 per cent.)	5.0	5.0	99.0
Benzole from coal tar (strength, 50 per cent.)	23.0	23.0	97.0
Methyl-alcohol	32.0	32.0	96.0
Toluol (pure)	44.6	69.8-71.6	94.5
Ethyl-alcohol, 95 per cent.	57.2	59.0	93.4
Ethyl-alcohol, 60 per cent.	60.8	80.6	92.8
Ethyl-alcohol, 45 per cent.	68.0	87.8	92.0
Petroleum (test)	77.0	109.4	91.0
Xylol—from coal tar	86.0	116.6	90.0
Oil of turpentine	95.0	111.2	89.0
Cumol, from coal tar	102.1	132.8	88.2
Anhydrous vinegar	111.2	167.0	87.2
Amyl-alcohol (fusel oil)	114.8	116.6	86.8
Solar oil	140.0	176.0	84.0
Tar oil (medium frac. distill.)	145.4	181.4	83.4
Aniline (pure)	168.8	217.4	80.8
Di-methyl-aniline	168.8	194.0	80.8
Aniline for red	185.0	221.0	79.0
Toluidin (ordinary)	185.0	224.6	79.0
Nitro-benzole	194.0	217.4	78.0
Xylidin	206.6	249.8	76.6
Paraffine oil	224.6	302.0	74.6
Naphthaline	392.0	440.6	56.6

In concluding this article, and as bearing directly on the ignition and non-ignition of oils on wool, cotton and jute, we have reproduced the following from a book on Spontaneous Combustion by C. J. Hexamer, C. E.:

"We have seen that the spontaneous combustion of oily rags or waste is caused by a rapid absorption of oxygen from the air, and that oils which have a great avidity for oxygen are the chief causes. By a number of experiments, it has been shown that when vegetable or animal oils contain one-third or over mineral oil, they will not ignite waste impregnated with them, spontaneously. The excellent experiment of Dr. James Young showed that in a chamber in which the temperature varied from 130° to 170° F.

Boiled linseed oil on cotton ignited in	....	1½ hours.
Raw " "	....	4 "
Lard " "	....	4 "
Colza " "	....	6 "
Olive " "	....	5 "

Seal oil and mineral oil, equal parts on cotton, would not ignite.

TEMPERATURE OF CHAMBER FROM 180° F. TO 200° F.

Colza oil on wool ignited in	....	6 hours.
Olive oil on cotton "	....	2 "
Olive oil on wool "	....	7 "
Seal oil on wool "	....	7 "
Whale oil on jute "	....	3 "
Whale oil on cotton "	....	9 "
Cottonseed oil on wool "	....	3 "
	....	5¼ "

The following were not ignited by twenty-four hours' exposure in the hot-air chamber:

Olive oil and mineral oil, equal parts, on cotton.
Colza oil and twenty per cent. mineral oil on wool.
Seal and mineral oil, equal parts, on wool.
Whale and mineral oil, equal parts, on jute.
Cottonseed oil and twenty per cent. mineral oil on wool.

And the following table showing the results of the experiments of J. J. Coleman:

	Entered into Combustion After	At a Temperature of
Cotton waste saturated with whale oil	3 hours	165° C.
Cotton waste saturated with olive oil	4 "	177° C.
Olive oil and 20 per cent. mineral oil	8 "	177° C.
Mineral and olive oil, equal parts, no change after lapse of twenty-six hours; after twelve hours, temperature 95° C		
Wool waste and seal oil	3 "	194° C.
Wool waste and whale oil........................	3 "	188° C.
Wool waste and cottonseed oil	5 "	178° C.
Wool waste and olive oil.........................	7 "	177° C.
Wool waste and refined rape oil	6 "	177° C.
Wool waste and crude rape oil	8 "	163° C.
Wool waste and cottonseed oil with 20 per cent. mineral oil; seal and mineral oil, equal parts; olive and mineral oil, equal parts, unaltered after lapse of twenty-six hours		
Jute waste with whale oil	8 "	180° C.
Jute waste with whale oil and mineral oil, equal parts, unchanged after twenty-six hours		

AGENTS AND SUB-AGENTS.

The relations of agents and sub-agents to their principals are not, perhaps, as well understood as they should be, and we have, therefore, considered it advisable to enumerate a few of the more important points in connection with their appointment, their powers, and their duties.

Appointment.

An agent may be appointed — by writing, orally, or by implication from the course of business.

Where there is a written appointment his powers are limited by that. In determining his authority otherwise, regard should be had to the manner in which he is held out by the company; the usual mode of doing business; the scope of his employment; the character of the authority known to have been granted; and the particular circumstances of the parties or of the transaction.

Classes.

General agents. Special agents. Sub-agents.

An agent authorized to issue and renew policies, and to transact business in a particular locality is a general agent.

A special agent is one to whom the company has entrusted the important duties of inspecting risks and adjusting losses. As a general rule local agents are to submit to the authority of special agents and adjusters.

Sub-agents are those whose duties are confined to soliciting risks, taking applications for insurance, receiving and remitting premiums to the general agent, and all such minor acts, without the power to make a complete contract.

Liability of Principal for Acts of Agents.

The principal is liable for such acts, including frauds, as are committed in the course of the agent's service or employment, and for the principal's benefit, though no express command or privity of the principal be proved.

Although the principal may not have authorized the particular act, yet if he has put the agent in his place to do that class of acts he must be answerable for his conduct.

When the agent is appointed for the performance of certain specific duties the principal will not be bound where the agent passes beyond the limits, *i. e.*, the apparent limits of his powers; but he cannot escape liability by secret restrictions while continuing to hold out the agent as having full power to make contracts.

The powers of a general agent are co-extensive, *prima facie*, with the business entrusted to him, and persons dealing with him, while they are put on inquiry as to the extent of his powers are not bound by secret instructions not communicated to them.

Where an agent, in violation of his authority, issued a policy covering property outside his territory, the assured being ignorant of the limit imposed, it was held that the company might ratify or disallow the policy; but the disavowal, to be effective, must be prompt, and notice thereof given at once to assured.

It has been laid down in the United States that foreign companies are justly held bound by all the acts of their general agents representing them in that country.

The opinion of an agent as to the legal effect of the language of the contract does not create obligations or change those already existing. But the agent would be liable to the assured for any wilful misrepresentation or deceit irrespective of whether the principal was rendered liable or not.

A company is not liable to the assured for false representations by the agent as to the validity of the policy, the assured being induced thereby to settle a loss for less than his claim, but the agent is liable.

A contract varying a policy must, in order to become the act of the company, be executed in accordance with its conditions, and those who trust to verbal contracts with an agent do so at their peril. If the manner in which all changes in the contract are to be effected is notified, as is customary, in the policy, the assured must be taken to know the agent's power in this respect.

Those who deal with a sub-agent, where the circumstances of his employment indicate limited powers, are bound to know the extent of those powers. It would be a dangerous doctrine if one who was appointed merely to solicit insurance could bind his principal further.

Knowledge of agent is imputed to the principal subject to the following: With respect to knowledge acquired before the relation commenced it is necessary that such knowledge should be remembered by and actually present in the mind of the agent in order to charge the principal as well as so material as to make it a duty that it should be communicated, there being at the same time no reason why the agent should refrain from doing so.

Knowledge obtained while acting in confidential relations with third parties:—An agent is not bound to communicate this, and it cannot be imputed to the principal.

Knowledge by the agent will not affect the principal when the agent is acting in collusion with the assured, or is meditating a fraud on the principal.

Notice given to, or knowledge acquired by the agent after the work for which he was employed has been terminated, or with respect to matters outside the sphere of such agent's action, will not affect the principal; *e. g.* notice to a soliciting agent after the issue of the policy.

Knowledge by an agent to bind the company must have been communicated to the agent as such and mere rumour, street talk, etc., will not fix the principal with notice. In all cases it is necessary to establish in evidence the fact of the agency before evidence imputing knowledge can be given.

Where the agent has inspected the premises he fixes his company with notice of whatever was apparent.

Duties and Liabilities of Agent to Principal.

Agents are bound to know the law; to execute the orders of their principals whenever for a valuable consideration they have undertaken to perform them, without negligence or delay; and any failure to carry out their duty will render them liable to the company; *e. g.*, a failure to cancel a policy at once when so ordered. The agent is required to exercise the same degree of care and skill as men in the insurance business usually possess, to keep his principal informed of his doings, and to give reasonable notice of whatever it is important he should know.

An agent cannot underwrite a policy on his own property which will bind the company. The method in which he should proceed is to send in an application to the company and charge as if for business of a third party. He cannot consent for the company to an assignment of his own policy.

Premiums.

A general agent may receive premiums in any usual mode and arrange for them as customary. He may take a cheque, or the note of the assured for the premium, or give credit, he himself becoming responsible. Where he gives grace for premiums overdue the company will be bound, and even if that act was outside the scope of his powers, if the company receive his account with the entry of acceptance of overdue premiums without any objection his act will be ratified.

His fidelity to his principal must never be subordinated to his own interest; he is held to the utmost good faith and for any violation of duty, negligence, or omission to act he will be personally liable.

Delegation of Power.

In some books it is laid down that an agent cannot delegate his authority to another; but the rule is an inconvenient one and many exceptions have been engrafted on it. Acts of mater-

ial importance, no doubt, cannot be delegated; thus, counter-signing policies, signing interim receipts, etc., but "an agent must necessarily perform a great number of acts through persons to whom he delegates his authority." In a New York case, Earl C.J. said: "An insurance agent can authorize his clerk to contract for risks, to deliver policies, to collect premiums, and to take payment of them in cash or securities, or to give credit, and the company will be bound, the maxim *delegatus non*, etc., not applying to such cases."

If an agent fails to pay over money within a reasonable time, and it is thereby lost, he will be liable to his principal for his neglect.

An agent who has paid a premium at the request of the assured may maintain an action to recover the sum so paid, and no assignment from the company is necessary.

Sub-Agents

Are agents of general agents. They are empowered to take risks, to secure applications which are to be forwarded to the general agent and to receive and receipt for premiums.

Sub-agents cannot bind the company to issue a policy. If the general agent receive and accept an application forwarded by a sub-agent then the company is bound but not before.

Sub-agents have no power to sign interim receipts or to alter the contract of insurance in any way.

The condition in policies of insurance that if the agent or sub-agent answers the questions in or fills up the blanks of an application form, he shall be considered the agent of the assured and not of the company, has been universally disapproved. A judge in a New York case sarcastically observed: "Calling snow hot does not make it even warm." But where the stipulation is contained in the application it is brought home to the assured, and he must be considered as having contracted on that understanding. The case is then much stronger against him.

Revocation of Authority.

By notice given to the agent; before which time his acts will bind the company, he and those dealing with him being ignorant of the revocation.

By the insolvency or bankruptcy of the company.

By lapse of the period for which the agent was appointed.

By the death of one of the partners of a firm which had been made an agent, or of one of two or more joint agents.

PAROL AGREEMENTS.

We will first define under this heading the legal meaning of parol, verbal, and oral.

Parol means by words — including oral and written — without seal.

Verbal means expressed in words — written or spoken.

Oral means by word of mouth — spoken, not written.

Verbal and oral contracts are simple contracts not of record.

Written contracts. — Evidenced by writing.

The only difference between verbal and written contracts is in the mode of proofs.

The principles governing parol agreements may be stated as follows (the distinction between an agreement before and after the issuing of a policy should be carefully noted):

If made by an agent it must be within his authority in order to bind his principal.

An offer to insure does not constitute or create a contract, and may be withdrawn at any time before acceptance. An agreement to insure, made by one having an insurable interest in the subject at risk with an agent having requisite authority to bind his principal, will be legally binding upon the insurance company, in the absence of any statute law requiring such contracts to be evidenced by writing. But an acceptance of the offer as made, without any change, must be signified. Payment of premium may be made at the time of entering into the agreement, or upon the subsequent delivery of the policy.

It is important to remember that such an agreement must embrace all the requisites of an ordinary insurance such as the insurable interest, the amount covered, the subject at risk, the peril insured against, the rate and amount of premium, the dates

of commencement and termination of risk, unless, as in warehouse insurance at short terms, the time is to be left "open" or "undeclared"; and where the agent may represent several companies, the name of the office in which the risk is to be placed. All these points are essential, and an omission of any of them will render the agreement nugatory.

Such an agreement, unless otherwise specified, is in fact a contract for a policy made according to the form in ordinary use by the agent's company.

A court of equity may compel the delivery of a policy agreed and contracted for, either before or after a loss. The same court may enforce the payment of the loss, under such a contract before the delivery of the policy.

When the policy has been accepted, any subsequent parol agreement by the agent to change or alter any of the conditions of the contract is, until endorsed upon the policy, of no force, as in accordance with the conditions thereof; which conditions must control all agreements, verbal or written, connected with the policy, subsequent as well as prior to acceptance by the insured.

Verbal or oral agreements, to insure upon certain terms and conditions, prior to the issue and acceptance of the policy are held to be waived unless inserted therein.

"A contract cannot exist partly in writing and partly by parol."

A STATUTORY FORM OF POLICY

For all Canada, and the Advantages of same.

The conditions of the fire insurance policy were first used as found necessary in the simple early contracts.

These were added to as occasion arose, and the underwriters required further protection to guard against different contingencies and different kinds of fraud; to which latter, perhaps, the early forms of policy were an invitation.

The insurance policy is a conditional contract and has been aptly designated as a "perpetual experiment," "entirely on speculation," where the underwriter is completely at the mercy of the insured, being necessarily ignorant, beyond the facts that enquiry may elicit, as to the circumstances attending the risk, hence open to fraud by designing parties who may misrepresent material facts connected with the subject of the proposed insurance. Hence the various specific conditions, printed or written, attached to the policy result from the peculiar nature of the contract.

They are simple general stipulations, for the protection of the underwriter against fraud, which the insured, by the acceptance of the policy, agrees to observe during its currency.

They have been found essential to the business, have arisen out of and grown up with the business, and are inseparable from it, and are now engrafted into the policy as a part of the system.

When we consider that every company doing a fire business has probably a different experience to report of the same field of operations, — one having made money and another having lost heavily, or one finding fraud prevalent and another a certain freedom from it, etc.; and when we consider too the varied

experience of a company having agencies all over the world, and having to deal with different contingencies and exigencies in many parts, and further that insurance conditions are not made specific to meet a certain case, but general to meet every emergency, then it becomes no longer a matter of wonder that each company has a different set of conditions.

We can, therefore, understand why one company, for instance, not having encountered a loss on plate glass, resulting in a vexatious law suit, will not mention plate glass in its conditions, while another having this experience will limit its liability to a plate three feet square. And so on with some of the various differences that are found to exist in the independent conditions.

Another reason for the varying conditions may be found in the efforts of the offices to keep abreast of the legal decisions as pronounced from time to time by the courts.

So it may happen in a stock loss, where there are ten or twelve policies involved with independent conditions, and perhaps in the written wording not concurrent; one will be found not to cover certain articles by its conditions, another may be voided by breach of certain stipulations, another may call for adjustment under one plan, and others again require some other way, resulting in delay and annoyance in the settlement when all should be plain and easily arranged, and the indemnity which the assured thought he had secured for himself in case of loss may result in but a partial satisfaction of the damage he has certainly sustained.

But it is not only from consideration of points such as these, important as they undoubtedly are, but from a further evil, directly against public safety and welfare, that first induced the legislatures to intervene between the companies and their clients.

It is a well-known fact that the conditions of policies are complicated and lengthy, and difficult for the ordinary mind to grasp. Further, that very few people attempt to study out what the companies require from them as their part of the insurance contract.

Some companies in the States, taking advantage of this latter fact, started out on a career of deceit and fraud, receiving applications and premiums, while by their conditions they could hard-

ly be held liable for any loss. This took place in New Hampshire, and we quote some statements from the pen of Chief Justice Doe of that state, which will show the evil which the legislature believed to exist, and which it cut up by the roots by the enactment of certain laws regulating the conditions of fire policies:

"The purpose of these fraudulent companies was accomplished by applications and policies drawn up, not only in fine type almost injurious to the eye to read, but containing a number of conditions, stipulations, covenants and warranties, so involved in a mass of detail and verbiage, and so complicated in their nature that no ordinary man could understand the document to which he was persuaded by zealous soliciting agents to set his name; and even an astute and able lawyer would have difficulty in finding out what was the intent of the insurance company which used this dark and inexplicable riddle as its conditions.

So when a loss occurred the assured first found out that he had applied for the policy, when in reality he had been most earnestly solicited to take out one. Next he was informed that he had not only obtained the policy upon his own application, but had obtained it by a series of representations (of which he had not the slightest conception), and had solemnly bound himself by a general assortment of covenants and warranties (of which he was unconscious), the number of which was equalled only by their variety and the variety of which was equalled only by their supposed capacity to defeat every claim that could be made upon the company for the performance of its part of the contract.

He was further informed that he had succeeded in his application by the falsehood and fraud of his representations, the omission and misstatement of facts, which he had expressly covenanted truthfully to disclose. After this he was measureably prepared for the next regular charge of having burned his property.

These policies were kept abreast of the times by the insertion of new conditions and stipulations, relieving the company from liability, as the court decisions in regard to certain points rendered them necessary.

The increasing number of stipulations and covenants, secreted in the usual manner, not being understood by the premium payer until his property was burned, people were as easily beguiled into one edition as another until at last they were made to formally contract with a phantom that carried on business to the limited extent of absorbing cash received by certain persons who were not its agents.

When it was believed that things had come to this pass, the legislature thought it time to regulate the business in such a way that it should have some title to the name of insurance and some appearance of fair dealing; and to this end the act of 1855 was passed."

But besides the elimination of any such danger, as that which we have just outlined, there are many other reasons why a standard form of policy for all Canada should be adopted.

The committee of the National Board of Fire Underwriters, in submitting their form, say of it:

"The form recommended is that in almost universal use, and has the merit of being also in the form of a legal contract. While the great benefit, accruing to both companies and their dealers, from uniformity of policies cannot be questioned, the prevention of disputes after losses have occurred, and the full protection afforded must of themselves be the best commendation that can be offered in favour of a uniform policy."

In the first place, then, a uniform policy would be a great benefit to the insurance companies and their agents. It would do away with each company's own peculiar wording and would facilitate adjustments. It would be a preventive of disputes after loss, while the conditions, having been drawn up and sanctioned by legislative enactment, would be well-known and understood. And a decision in one case would serve for all the companies (the conditions being the same), and would thus save litigation.

A uniform policy would simplify adjustments; the contract being the same in each case there would be nothing to do but find out the loss, and pay according to the policy.

The form itself would probably be a fair one. It would be a form drawn up by the representatives of the people, decided on after judicial deliberation and discussion.

The forms adopted by the states of New York and Massachusetts show a fair and impartial spirit and an evident desire to deal justly between the companies and their customers.

If the legislature did its duty the form would protect equally the companies and the assured.

Nearly all the statutory forms now in operation allow the companies to vary the conditions, if these variations are printed in a conspicuous place and in different colored ink, or in such a way as to show plainly that they are additions or variations of the ordinary contract. By this means the companies can still protect themselves on points, perhaps not touched on by the statutory form, but which the companies consider essential to the contract.

Under a statutory form the assured need not read through his policy in search of special and technical conditions against him. He knows that the main provisions of the contract are definitely settled by the law of the land, and if he does not like the extra conditions imposed by the variations, he can probably find a company which has accepted the statutory form without any amendment.

We may close this article with a few remarks from Griswold, writing on the standard policy:

"Within the past few years a number of the states, both eastern and western, have adopted what is called a 'standard policy,' the use of which is made obligatory upon all companies operating in those several jurisdictions.

Massachusetts was one of the first to lead off and was subsequently followed by New York, since which time some eight other states have legalized these policies, most of them taking the New York form for a basis." (In Canada, Ontario and Nova Scotia have statutory policies; Nova Scotia having adopted the Ontario form with minor variations).

"The result of this change has been a great simplification of hitherto disputed points, thus giving the companies a much better

standing in the courts than under the old voluntary form where all ambiguities were ruled against them. Under the standard form both insurers and insured stand upon the same ground, and the doctrine of waiver can now scarcely find a foothold in the statutes. Since so many states require its use the companies are using it in other states where not required, thus obviating the great objection first held against standard policies that the companies were compelled to make use of two kinds of policies in adjoining states.

The underlying principles of standard conditions are about the same as heretofore; but they are made obligatory, hence uniform among the offices, and will do away with many lawsuits against the companies which will have the policy contract behind them. To what extent the introduction of statute law into the policy form may influence future litigation remains to be seen.

The point had not come up at the date of this writing, but it is an interesting and important fact that the language of the 'standard policy' is not the language of the company issuing it but the language of the legislature of the state which enforces it."

A PLEA

For a Uniform Basis of Taxation of Fire Insurance Companies.

The subject of taxation is so vast and there are so many systems in use and theories in relation to this important matter that we do not pretend to enter deeply and thoroughly into it.

Our idea in this present article is rather to show the peculiarities, often injustice and inequality, of the present methods, and to suggest a plan which perhaps may be some improvement on the existing anomalies.

Let us take up then the present system of taxation on fire insurance companies, as practised in the Maritime Provinces.

First of all, however, before a company can obtain a license to do business in Canada, it must make a deposit of one hundred thousand dollars with the Dominion Government.

In New Brunswick, the companies are taxed in St. John city and county on their profits, that is allowing for all deductions, such as losses, returns, cancellations, expenses and re-insurances. There is also a charge for the maintenance of the Salvage Corps. Woodstock and Fredericton levy a local tax, based on a certain percentage of the gross premium income without reference to losses.

In addition to these there is a provincial tax consisting of a license fee of one hundred dollars and a tax based on income, only taking off cancellations and re-insurances, with no allowance for losses and expenses, so that a company may pay out all its premiums in New Brunswick for losses and still have to contribute one hundred dollars to the Provincial Government and one per cent. of its premium income as above determined. In this way too, companies are taxed twice on their St. John city and county and Fredericton and Woodstock premiums.

In Nova Scotia we find irregularity and confusion. Some towns tax the companies, some do not. Some exact a license fee, but the majority levy taxes on the following iniquitous basis: The income of a company in the town is demanded, allowance being made, however, for losses, cancellations, and re-insurances. This net income is then multiplied by five, and a certain percentage of the exaggerated amount thus obtained is required yearly from the companies. The city of Halifax levies a straight license fee of two hundred dollars yearly.

In Prince Edward Island a license fee of one hundred dollars is levied by the Provincial Government, and the same sum is collected at Charlottetown.

These then are the systems now in force, presenting peculiar and unjust features and irregularities, troublesome in their operation and burdensome in their effect, necessitating higher rates to meet the added expense they impose.

Turning now from the local aspect, and looking to the United States, we find an infinitely worse state of affairs :

"In some few states," writes Griswold, "deposits, licenses, taxes and fees, have been assessed upon insurance companies until they are almost prohibitory.

In addition to state deposits, varying anywhere from ten to fifty thousand dollars for each agency company — state, county and municipal licenses, ranging from twenty-five dollars to fifteen hundred dollars each, are simultaneously in many instances required from each company; while special municipal licenses for the benefit of particular objects, as a medical college at Mobile, two hundred and fifty dollars, fire departments two per cent. on each company's receipts — as if insurance companies instead of the uninsured property were solely benefited thereby, and for almost every other conceivable purpose for which a permanent source of revenue might be needed. Nor is this all. Agency insurance companies are further subjected to annual state, county and municipal taxes, varying from one to five per cent. upon the gross receipts of each, and this simultaneously. And to secure the payment of these exorbitant assessments agents are in some localities compelled to give bonds, in amounts from five hundred

dollars to two thousand dollars — under penalties for failure to comply with any of these provisions in the form of fines, varying from five hundred dollars to three thousand dollars.

Fortunately these prohibitory assessments are confined to a comparatively small number of states. In others the assessments are comparitively light." And the writer concludes, that in view of these added expenses, a commensurate increase must be made to the rates of insurance.

In the Universal Schedule we find the following:

"This schedule is based upon a five per cent. profit above the actual cost of insuring property, and contemplates no tax, other than a fair one of two per cent. upon the net results to a company after deducting losses and expenses.

Of course if a further tax is imposed, the expense to the companies will be to that extent increased, and an extra premium must be collected. Insurance companies do not object to paying to any state a percentage tax on the profits of their business in the state, or upon the excess of their received premiums over paid losses and expenses. It is difficult for them to see why they should be called on to pay a tax on the gross premiums of any state where the amount paid by them to its citizens, in the shape of fire losses and commissions to agents who are resident citizens, may consume all or more than the premiums received. In such a case they are taxed for the doubtful privilege of leaving more money in the state than they take out of it." Charles Sumner spoke truly when he said "a tax upon insurance is a tax upon a tax, and therefore a barbarism."

And in reference to agency donations to fire departments we find C. C. Hine, of the Insurance Monitor, writing as follows:

"There is more real injustice to insurers, under a more plausible guise, in this species of tribute than in almost any other extorted from them. The plea that insurers are more interested than others and should pay by direct contribution is practically untrue. A good department reduces the rates of insurance and in this way the underwriters pay their share. There would be the same propriety in assessing insurers for the fire walls or slate roofs of citizens, upon the plea of preventing conflagration in

which underwriters might be interested. In one sense a department is not a benefit to underwriters; as when it reduces the rates of insurance, or so increases the sense of security in a community as to induce many to insure less and some to insure nothing. And yet we believe in a good fire department, but as we pay our share in reduced rates we must be chary of donations.

The hardship of which insurers have a right to complain is this, that when by reduced rates or diminished business they have already paid indirectly to a department, they should be constantly called on for direct contribution to its support. The department belongs to the town, is gotten up by the town, and is for the town, and should be supported by the town, and it will be so supported; there is no real necessity for applying to insurance companies."

Such being the views of leading insurance men let us now examine more carefully into the present systems, by the aid of the principles of political economy.

The taxation of the fire insurance companies in the Maritime Provinces is based on two systems; viz., an income tax and a license fee. Of course it can be at once understood that any tax on insurance companies is an indirect tax; that is a tax levied on one person and paid by another, as distinguished from a direct tax, which is paid by the person upon whom it is levied. The beer duty likewise is an indirect tax, for while it is in the first instance paid by the brewer, yet the tax really comes out of the pockets of the consumers of beer, because the price they are compelled to pay is increased by an amount which must at least be equivalent to the tax imposed. With the insurance companies the same is true. If the item of taxation is heavy the rates must be high to meet it.

As an illustration of how the tax on an insurance company is paid by the people we may take the town of Woodstock, where it was decided to tax the insurance companies, and as a consequence the rates were raised to meet the added expense. The incidence of the tax, as it is called, denoting the real from the nominal payer, in relation to the insurance tax falls on the people who insure; not on the companies.

But it may be urged, as an objection to this, that when the New Brunswick provincial tax was imposed on the insurance companies no raise took place in the rates. This is quite true, but at the same time it must not be forgotten that had not this added expense been imposed some reduction might have been adopted, which the tax rendered out of the question.

Further it may be well in considering this question to lay down the second canon of taxation, as formulated by Adam Smith, and which is perhaps the most important of the four canons he has given us.

The second canon then states:

"The tax which each individual is bound to pay ought to be certain and not arbitrary. The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor and to every other person . . . The certainty of what each individual ought to pay, is in taxation a matter of so great importance that a very considerable degree of inequality, as appears I believe from the experience of all nations, is not near so great an evil as a very small degree of uncertainty."

Now we do not believe with some that insurance companies should not be taxed. That they should contribute in some way to the province or state in which they carry on business is, we think, perfectly fair. The question is in what manner they should do so, and to what extent. A tax on insurance companies has this to recommend it, that the incidence of that tax falls principally, not so much on the poor where too many taxes weigh heavily, but on the wealthy, on capitalists, on owners of large plants and establishments, who have much to insure. Granting then that the tax is fair, all that the companies require is that it should be reasonable, and as the second canon states, certain and not arbitrary, the time and the manner of payment clear to the contributor and to every other person.

We submit that the present levying of taxation on insurance companies in the Maritime Provinces has none of these features. In the first place it is not reasonable; the different systems in vogue, the double taxation in some towns by a provincial and municipal tax, the iniquitous multiplying of the insurance re-

turns for taxation purposes, and the different times of levying, all take away its claim to this feature.

Again: the amount is not certain but arbitrary. Could any act have been more arbitrary than the suddenly imposed New Brunswick Taxation Act on banks and insurance companies?

A company may aid many enterprises by insuring the projectors; it may do a general business and thus roll up a large premium income; but at the same time this income may be paid out twice over in losses and expenses, yet the tax in New Brunswick, not fixed as a license fee but becoming heavier as the business increases, still has to be paid. This is indeed an argument against an income tax; the amount is not certain but continually varying.

On the other hand it may be said that the income tax makes some attempt at equality of taxation, but to quote the second canon again — a degree of certainty is worth many degrees of equality. As to the time and manner of payment being clear, these features from the very nature of the present mode of independent taxation by provinces, cities, and municipalities, are impossible. And so it happens that nearly every month in the year shows an item of taxation in some part of the three provinces.

Another argument against an income tax is that it gives an opportunity to dishonest agents or managers to avoid the tax. The income of an insurance company in a certain field is not known; it has to be supplied by the officers of the company. Morality is unfortunately too often based on conventionality, and many, who pass for honest men, do not hesitate to cheat a government, although in the private transactions of life they would shrink from doing anything in the least degree dishonourable. In this way then an income tax operates with a certain degree of unfairness, because some managers or agents have a chance of evading the tax, whereas others have not.

If we turn now to the system of license fees, we find in it more of the general requisites of the second canon of taxation: "The tax which each individual is bound to pay ought to be certain and not arbitrary. The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain

to the contributor and to every other person." And again: "A very considerable degree of inequality is not near so great an evil as a very small degree of uncertainty."

But even a system of license fees by each town now imposing a tax, although much simpler and more workable than the present mixed mode, is nevertheless not a very distinct advance. The amount, instead of varying, would at once become fixed and there would be an immense saving of labour. It is evident, however, that the final solution of the question is not in a license fee at each town or city. This is but a step to a still further and simpler system.

It will be at once said that a license fee would also have to be paid without abatement of any kind, whether the company made a profit or a loss, while according to our own showing the present system in some cases allows for losses.

The advantages of a license fee in the certainty of the amount to be paid, and the saving of labor, would more than compensate the companies any additional expense attached to it; but the license fee could be so regulated by a plan of taxation, which we shall formulate further on, that this argument falls to the ground. In addition to the considerations that a license fee is certain, and also the great saving of labor, there is an argument in its favour which we believe has not been generally considered.

It is said, as a principal defence of an income tax, that a license fee bears unjustly upon the companies having the smaller incomes, and that where all have different ability to pay the license fee nevertheless taxes all alike. Let us examine this a little.

Suppose then there are two fire insurance companies doing business in New Brunswick. One is managed on a restricted policy, aiming at a large profit on a comparatively small business. This company writes freely on the good brick and frame dwellings, and churches and stores, well protected by the fire department in towns. It leaves alone all farm risks perhaps, and nearly all specials, such as mills and factories, unless exceptionally good in construction and surroundings. It guarantees indemnity to no new enterprises until they are well established, and proved

profitable risks approximately free from hazard. It aims at the cream of the business. On such a company an income tax is light, because its income is comparatively small, and the only way to reach it is by a license fee.

The other company does what is known as a general business. It takes farms and unprotected property generally in the country. It writes freely, nearly all manufacturing risks. It guarantees indemnity to the projectors of new enterprises. It is in its way a great help to commerce and industry, as by the protection it affords, men venture to engage in new industries and hitherto untried manufactories. In this way its premium income is large, and the income tax is a heavy burden. Added to this is the fact that its ratio of profit, though in some years it may be large, is on the average not above what the ordinary business man considers fair.

Under the income tax system then the companies doing the general business virtually pay the taxes for the restricted companies. In this way the active and enterprising agent, who does a large business, brings more expense on his company, in the way of taxes, than the slothful agent who, either by his own lack of energy or by the restriction of his company, does a smaller business, though the amount of net profit in the latter case may be much more than in the former.

And the deduction from this argument is that the license fee is the fairer plan, for if the company does a small business it is either the fault of the agent or of the restricted policy of underwriting which the company pursues.

Another argument, one which we have already mentioned, in favour of a license fee is that it is a great saving of extra labour. There are no long forms to be filled in, involving close research through a year's operations. The amount is certain, it is known to be due at a certain date, and when the time comes it has to be paid. There is no opportunity for dishonest managers and agents to avoid it; the amount is fixed.

As Fawcett states, there is no system of taxation which is not open to some objections, but the license fee system in regard to insurance companies appears to be free from many of the objections urged against other taxes.

Now a suggestion as to how this license fee should be imposed so as to yield approximately the same revenue with a minimum of trouble.

The plan of taxation is this: Instead of the indiscriminate, unsystematic taxation as now levied by province, city and municipality, let there be one fairly, heavy license fee for each Province, payable yearly or half yearly to the Provincial Government, and all other taxes abolished.

The amount of this fee could be ascertained by taking the total amount which the companies now pay in various taxes in each province for a number of years, so as to allow for the losses, and taking an average, regulate the license fee to give approximately this sum. If this should be done the rates in Woodstock could at once be lowered to their former level, and the rates in Fredericton and St. John city and county reduced in proportion to the amount of the tax taken off. The system is simple and the result is the same. The amount St. John, Woodstock, and Fredericton, or any other places imposing the tax, lose in revenue the inhabitants make up by the reduced cost of insurance.

Nova Scotia and Prince Edward Island could be treated in the same way. As a matter of fact this system is in force in Prince Edward Island, with the difference only that instead of the Provincial Government taking the total tax half is payable to the city of Charlottetown, and consequently the insurance rates in that place are graded so much higher.

It may be urged against a license fee of this nature that it would somewhat relieve the rich, by reason of the reduced rates of insurance in cities formerly imposing the tax, and that the poorer classes would not benefit by the reduction in rates. To this we would reply that insurance is actually more of a necessity to the poor than to the rich, for the reason that a fire often leaves the former entirely destitute, while the latter have generally other resources. Besides, the city affected in its revenue by the withdrawal of the insurance tax could make up the amount by a tax which would not affect the lower classes. Or again: the Provincial Government, being in receipt of an increased revenue, could remit or lower some form of taxation now imposed.

There appears to us no reason why this system of one Provincial license fee should not prove practicable.

DIGEST OF MARITIME PROVINCES FIRE INSURANCE CASES.

INDEX OF TITLES.

ABBREVIATIONS.

All. — Allen's Supreme Court of New Brunswick Reports.
Can. — Supreme Court of Canada Reports.
Han. — Hannay's Supreme Court of New Brunswick Reports.
N. B. — New Brunswick Supreme Court Reports.
N. S. — Nova Scotia Supreme Court Reports.
N. S. D. — Geldert & Oxley's Nova Scotia Decisions.
Old. — Oldright's Nova Scotia Reports.
P. & B. — Pugsley & Burbidge's New Brunswick Reports.
P. E. I. — Prince Edward Island Reports.
Pug. — Pugsley's New Brunswick Reports.
R. & C. — Russell & Chesley's Nova Scotia Reports.
R. & G. — Russell & Geldert's Nova Scotia Reports.
R. E. D. — Russell's Equity Decisions (Nova Scotia).

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6"

Action.

(i). *Covenant — Form of indorsement* — The agent of a company indorsed and signed the words "this insurance is hereby continued in the name of H. F." on a policy covering goods which had been purchased by the plaintiff. Held that the indorsement not being under the seal of the company the plaintiff could not maintain covenant on the policy. *Frost* v. *Liverpool and London and Globe Ins. Co.* H. T., 1871. Stev. Dig., 3rd ed., 433.

(ii). *Parties — Assignee of policy* — The assignee of a policy does not by such assignment acquire any right of action against the insurers. A new promise by the insurer, supported by a valid consideration to give the assignee the benefit of the insurance, will support an action. *Demill* v. *The Hartford Ins. Co.* 4 All. 341.

(iii). *Parties — Indorsement on policy — Loss payable to third party — Pleading* — An indorsement making the loss payable to a third party does not preclude the insured from suing in his own name. In the declaration in such an action it is not necessary to aver an order from the third party in favour of the insured. It is sufficient to aver that the loss was not paid to the third party nor to the insured. An allegation in a count upon a policy containing the conditions that the defendant had no mayor, etc., upon whom process could be served, is mere surplusage. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(iv). *Parties — Loss payable to third party* — Where a policy is issued covering goods, the property of A or held by A in trust or on commission, the promise of the company being to pay to A, and the consideration moving from him, B cannot maintain an action in his own name, though he has an interest in the goods, there being no allegation that A effected insurance as B's agent. *Maritime Bank* v. *Guardian Ass. Co.* 19 N. B. 297.

Action — (*Continued*).

(i). *Parties — Loss payable to third party* — Where a policy contained a clause "loss, if any, payable to the order of B, if claimed within sixty days after proof, his interest therein being as mortgagee," B may furnish preliminary proofs and bring an action in his own name. *Brush* v. *Ætna Ins. Co.* 1 Old. 459. But see *Abbinette* v. *North Western Life Ins. Co.* 21 N. B. 216.

(ii). *Assignment — Parties to action* — Assignor of a policy is entitled to sue in his own name thereon, provided notice of the assignment has not been given. *Brownell* v. *Atlas Ass. Co.* 31 N. S. 348.

Agent.

(iii). *Appointment of — Corporate Seal* — In order to prove that a person acting as the agent of a foreign insurance company by issuing policies in their name and receiving premiums is their accredited agent, it is not necessary to shew his appointment under the corporate seal. *Robertson* v. *The Provincial Mutual and General Ins. Co.* 3 All. 379.

(iv). *Evidence — Admission of* — Agent of company received proofs and requested time. Afterwards by letter he stated he had examined claim, that it appeared satisfactory and agreed to pay. By another letter he acknowledged that the company was bound to indemnify insured fully. In an action on the policy the jury were directed that if agent with knowledge of the facts had adjusted the loss with plaintiff, and there was no fraud, it would be evidence of the amount though not conclusive. Held, a proper direction. *Thompson* v. *Liverpool and London and Globe Ins. Co.* H. T., 1871. Stev. Dig., 3rd. ed., 434.

(v). *Agent's declarations — Evidence* — Declarations of agents, made while adjusting the loss, are admissible in evidence in an action against the company, irrespective of their effect under the conditions of the policy. *Bowes* v. *National Ins. Co.* 20 N. B. 437.

Agent — (*Continued*).

(i). *Evidence of agency* — It is sufficient evidence of agency that the person in question employed sub-agents, effected policies and paid losses in the company's name. *Peppet* v. *North British and Mercantile Ins. Co.* 1 R. & G. 219.

(ii). *Sub-agent — Authority of* — A sub-agent in the absence of notice to the contrary has implied authority to receive renewal premiums. *Gardiner* v. *Home and Colonial Ass. Co.* 2 N. S. D. 204.

(iii). *Waiver — Breach* — An agent with powers limited to receiving and forwarding applications for insurance has no authority to waive a forfeiture caused by breach of condition. *Torrop* v. *Imperial Fire Ins. Co.* 26 Can. 585.

Application.

(iv). *Representations in — Change of interest* — The policy of the defendant company stipulated that it was based on the representations in the application upon which a prior policy in the Glasgow and London Company was issued. In this application the plaintiff stated that there was no judgment or seizure against him at the time. Between the issue of the first and second policy a judgment was recovered and execution issued against the plaintiff. Held, that the representation was not limited in application to the date of the first policy but also applied to the date of the policy in the defendant company. *Long* v. *The Phœnix Ins. Co.* 34 N. B. 223.

(v). *Evidence* — The plaintiff's declarations of the value of a mill when applying for insurance is evidence to contradict him in another action as to the inferior quality of the mill. *Morrows* v. *Waterous.* 24 N. B. 442.

Apportionment of Loss.

(vi). *Specific insurance — Apportionment* — In order that there may be an apportionment, the same property must be insured in each company, and where one policy was distributive and

Arbitration.

the other not, the court refused to set aside a verdict against defendant in excess of half the loss. *Evans* v. *Stadacona Fire and Life.* 5 R. & G. 88.

(i). *Appraisement* — The company by repudiating all liability most distinctly aver that there is no disagreement as to mere amount of loss and cannot require an appraisement; and the assured is discharged from performance of the condition relating thereto. The matter of appointment of appraisers is one of negotiation, and assured having appointed one who is not accepted is not debarred from naming another. *Margeson* v. *Guardian Fire and Life Ass. Co.* 31 N. S. 359. Reversed on other grounds in 29 Can. 601.

(ii). *Condition precedent — Total loss* — A condition that any difference touching a loss should at the written request of either party be submitted to arbitration does not apply when the claim is for a total loss. Such a condition is collateral and is not a condition precedent to plaintiff's right to recover. *Adams* v. *The National Ins. Co.* 20 N. B. 569.

(iii). *Condition precedent* — A condition that any difference as to amount of loss or damage shall, at the request of either party, be submitted to arbitration, and that no action shall be brought on the policy till after an award, is not a condition precedent to assured's right of action in the absence of a request by the company. *Bishop* v. *Norwich Union Fire Ins. Co.* 25 N. S. 492.

Assignment of Policy.

(iv). *Absolutely or by way of mortgage* — Under an agreement between plaintiffs and one T. that T. should take over the business and carry it on, that policy should be assigned to him (subject to lien of holder of previous mortgage) that he should insure and charge premium to plaintiffs and divide profits equally between the two parties, T. went into possession, renewed the policy in plaintiff's name and charged them with the premium, but made the loss payable

Assignment of Policy — (*Continued*).

to himself. He afterwards assigned to trustees for his creditors' benefit and was declared insolvent. Held, that insurance was for plaintiffs' benefit and that they were entitled to the balance after paying off the mortgage and that T.'s assignee had no claim. *Schofield* v. *N. B. Patent Tanning Co.* 22 N. B. 599.

(i). *Indorsement — Rights of mortgagees, etc.* — An indorsement on a policy that the loss should be payable to A. B. to the extent of his mortgage interest is not a contract to pay A. B. nor an assignment of a chose in action, and when the policy has been avoided for breach of condition A. B. has no claim. *Cormier, administrator,* v. *Ottawa Agricultural Ins. Co.* 20 N. B. 526.

(ii). *Not communicated to assignee* — An assignment of policy by indorsement thereon by assured, not under seal and without assignee's knowledge, the policy having been issued by company under the seal, is invalid. *Crozier* v. *Phœnix.* 2 Han. 200.

(iii). *Notice of* — A mortgagee who gives notice to the company after loss of his equitable claim under the policy to the money, has perfected his right to the insurance money and has priority over a creditor with whom the policy has been deposited, notwithstanding such deposit. *The Queen Ins. Co.* v. *McPherson,* E. T., 1868. Stev. Dig., 3rd ed., 307.

(iv). *Parol — Equitable rights* — A verbal assignment with delivery gives assignee an equitable right to the proceeds of policy. *Manning* v. *Bowman.* 3 N. S. D. 42.

(v). *Change of interest* — An assignment by assured executed after he has ceased to have any interest in the property is of no effect. *Wyman* v. *Imperial.* 20 N. S. 487. Reversed 16 Can. 715, on other grounds.

Assignment of Property.

(vi). *Condition against* — An assignment by way of mortgage of the property insured and all policies thereon renders a

Assignment of Property—*(Continued).*

policy void under condition providing that neither the policy nor any interest therein shall be assigned or encumbered unless with the company's consent, etc., although the assured had other policies the conditions of which did not prevent their assignment. *Salterio* v. *City of London Fire Ins. Co.* 23 Can. 32.

(i). *Change of title, interest or possession — Mortgage* — A chattel mortgage of the property insured is not an "assignment." *Sovereign Fire Ins. Co.* v. *Peters.* 12 Can. 33.

(ii). *Assignment for benefit of creditors* — A bill of sale and assignment for the benefit of creditors amount to a "change of interest." *Torrop* v. *Imperial Ins. Co.* 26 Can. 585.

(iii). *Mortgage — "Change of title"* — A chattel mortgage is a "change of title" and an incumbrance even if incumbrance means an incumbrance on the policy. *Citizens Ins. Co. of Canada* v. *Salterio.* 23 Can. 155.

(iv). *Cancellation* — Notice of termination of insurance without returning unearned premiums and surrender of policy to agent for no other purpose than to get a new insurer substituted, no such substitution, however, being made, is not such a cancellation of the policy as amounts to a surrender. *Caldwell* v. *Stadacona Fire and Life.* 11 Can. 212.

Certificate of Magistrate.

(v). *Condition precedent* — A condition in a policy that the assured shall produce a certificate of a magistrate or notary public not concerned in the loss, etc., that he was acquainted with the character and circumstances of the assured, and that the assured without fraud had sustained a loss to the amount therein mentioned, is not complied with by a certificate which does not set forth the amount of the loss, and the setting forth of such amount is a condition precedent to the right to recover. *Borden* v. *The Provincial Ins. Co.* 2 P. & B. 381.

Certificate of Magistrate—*(Continued).*

(i). *Concerned in loss — Assignor of goods and policy* — The person to whom a policy is issued and in whose name the action thereon is brought cannot certify as a magistrate not concerned in the loss though he has assigned the goods and with them all his beneficial interest in the policy. *Stevens* v. *Phœnix Ins. Co.* 32 N. B. 394.

(ii). *Payee's relationship* — Relationship between magistrate and third party, to whom the loss is payable, is immaterial. *Ketchum* v. *Protection Ins. Co.* 1 All. 136.

(iii). *Condition precedent* — Production of a certificate from the nearest magistrate is a condition precedent to the right to claim for loss. *Moody* v. *Ætna.* 2 Thom. 173. *O'Connor* v. *Commercial Union.* 2 R. & G. 338.

(iv). *Nearest magistrate — Evidence* — There must be some evidence that the magistrate is the most contiguous. It is not sufficient to prove that he lives at Sable River, a country district, in which the insured property was situate. *Herkins* v. *Provincial Ins. Co.* 3 R. & C. 176.

(v). *Interest in loss* — When the nearest magistrate is a sufferer by the same fire he cannot certify as "not concerned in the loss as a creditor or otherwise." Semble, that the fact that he is a creditor of the assured does not disqualify him. *Ganong* v. *Ætna.* 6 All. 75.

(vi). *Refusal of certificate* — Non-production of certificate prevents recovery though due to the refusal of the magistrate to certify. *Logan* v. *Commercial Union.* 13 Can. 270.

Contract.

(vii). *Correspondence* — Distinct offer and acceptance necessary. *Bishop of Chatham* v. *The Western Ass. Co.* 22 N. B. 242.

(viii). *Completion of contract — Liability of agent for not insuring* — *McGoldrick* v. *Eastern Express Co.* 1 Pug. 138.

Damages.

(i). *Wrongdoer — Liability of, when property insured* — Where plaintiff's property has been burned through defendant's negligence it is no answer to defendant's liability for damages that the property was insured. *Robinson* v. *New Brunswick Railway Co.* 23 N. B. 338. Reversed 11 Can. 688, on other grounds.

(ii). *Tenant for life* — Measure of damages recoverable by a tenant for life of the insured premises is the full value thereof to the extent of the sum insured. *Caldwell* v. *Stadacona Fire and Life.* 11 Can. 212.

Evidence.

(iii). *Proof of loss — Admissibility of against insurer* — Proof and particular account of loss in accordance with the conditions of policy, delivered to the company's agent by the insured although not required to do so, are admissible in evidence as part of the preliminary proof. *Parkins* v. *The Equitable Ins. Co.* 4 All. 562

(iv). *Concealment — Agent's opinion as to materiality* — The agent of an insurance company cannot be asked in an action on the policy whether he would have taken the risk if certain facts had been communicated to him. *Perkins* v. *The Equitable Ins. Co.* 4 All. 562.

(v). *Admissions — Society of Underwriter's Act* — The declaration of an underwriter on the policy relative to the subject matter are evidence against the defendant in an action against the secretary, under 21 Vict., c. 61. *Duffy* v. *Stymest.* 5 All. 197.

(vi). *Admissions — Executors and administrators* — Statements of an administrator before assuming that character, tending to contradict his evidence in an action by him on a policy of insurance, are admissible. *Cormier Administrator* v. *Ottawa Agricultural Ins. Co.* 20 N. B. 526.

Evidence — (*Continued*).

(i). *Incendiarism* — Evidence relating to the finding of unburned matches and shavings near the place of fire is inadmissible, there being no plea of incendiarism. *Royal Ins. Co.* v. *Duffus.* 18 Can. 711.

Foreign Company.

(ii). *Policy — Where issued* — Company's business was conducted by an agent residing at St. John, to whom applications were made through brokers. Held, that a policy was issued when agent forwarded it to broker for delivery. Notice of prior insurance to a broker is not notice to the company. *McLachlan* v. *Ætna Ins. Co.* 4 All. 173.

(iii). *Contract, where made — Illegality* — A policy issued in New York and delivered by a broker to his agent in St. John, and by him delivered to defendants who gave a premium note, is not complete until actually delivered and is illegal under Act 19 Vict., c. 45, prohibiting a foreign insurance company from doing business in the province without first filing a certificate in the provincial secretary's office. *Allison* v. *Robinson.* 2 Pug. 103.

(iv) A., holding himself out as the agent in St. John of a company with head office in New York, forwarded applications for insurance to a broker in Boston who procured the policy, the premiums being charged against him. He then forwarded the policy to A., who delivered it to the assured, taking a note to himself and sending the broker his own note for nine-tenths of the amount. Held that this was illegal under 19 Vict. c. 45, and was not distinguishable from *Allison* v. *Robinson.* *Jones* v. *Taylor, re Oulton.* 2 Pug. 391.

Fraud.

(v). *Entire contract — Fraud as to part* — A policy covering several buildings and merchandise in one of them and having a condition that in case of any fraud or false swearing

Fraud — *(Continued).*

the claimant should forfeit all claims under the policy, is an entire contract, and if plaintiff is guilty of fraud or false statements as to the merchandise, he cannot recover any part of the insurance. *Cashman* v. *The London and Liverpool Ins. Co.* 5 All. 246.

(i). *False swearing* — Plea that plaintiff rendered to defendant false documents in support of his claim is good under a condition that if the claim was in any way fraudulent all benefit under the policy should be forfeited. *Gibson* v. *The North British and Mercantile Ins. Co.* 3 Pug. 83.

(ii). *Over-valuation* — Plaintiffs valued property (purchased by them from a bankrupt estate for $3,500) at $15,000, and stated in application that their criterion of value was cost of rebuilding. Evidence was given of different valuations ranging from $12,000 to $20,000. Held, that there was no breach of condition as to fraudulent over-valuation. *McGibbon* v. *Imperial Fire Ins. Co.* 2 R. & G. 6.

(iii). *Over-valuation* — Under a provision that assured shall forfeit all remedies if guilty of "any wilful misstatement with intent to deceive the company as to the amount of loss," an over-valuation of part of the property in the statement of loss so great as to convince the Court that it was fraudulent, will preclude recovery. *McLeod* v. *Citizens Ins. Co.* 1 R. & G. 21.

(iv). *Over-valuation* — *Ignorance* — Jury having found that assured made incorrect representations through ignorance, held that this answer negatived fraud. *Cann* v. *Imperial Fire Ins. Co.* 1 R. & C. 240.

(v). *Over-valuation* — Verdict set aside, although the jury have negatived fraud where the Court, on a survey of the whole evidence, thought the claim fraudulent. *Longley* v. *Northern Ins. Co.* 3 R. & C. 516.

Gunpowder and Explosives.

(i). *Unusual quantity* — When the quantity of gunpowder kept was only such an amount as is usual in a general stock in country stores, for insurance on which the application was made, and the loss was not caused by the gunpowder, there is no breach of condition as to storage. *Hammond* v. *Citizens Ins. Co.* 26 N. B. 371.

(ii). *Removal before fire — On premises against insured's will* — To a plea that plaintiff had more than twenty-five pounds of gunpowder on the premises there was a replication that the gunpowder was put there without plaintiff's privity; that he had tried to procure a conveyance to remove it without success; that at the time of the fire it was removed and thrown in the harbor and no loss was occasioned by it. Held bad on demurrer. *Faulkner* v. *Central Fire Ins. Co.* 1 Kerr 279.

Increase of Risk.

(iii). *Third party causing — Increase of risk — Construction of condition* — A condition in a fire policy stating that it should be void "if the risk is increased or changed by any means whatever" without the written permission of the insurers, does not apply unless the risk was increased by the act of the plaintiff or by his direction. *Copp* v. *The Glasgow and London Ins. Co.* 30 N. B. 197.

Insurable Interest.

(iv). *Deed, unregistered — Subsequent deed* — Previous to the effecting of insurance on a leasehold building the lease was assigned to A by deed duly registered. B, who was in possession and who had effected insurance as owner, claimed title by a previous unregistered deed. Held, that the title was in A and that B had no insurable interest. *Crockford* v. *The London and Liverpool Ins. Co.* 5. All. 152.

(v). *Insolvent* — A debtor having executed an assignment under the Insolvent Act 1869, but not in duplicate nor registered,

Insurable Interest — (*Continued*).

and still remaining in possession, has such an insurable interest as will enable him to recover under a fire policy. *Parlee* v. *Agricultural Ins. Co.* 3 Pug. 476.

(i). *Mortgage — Absolute deed — Agreement for reconveyance* — An agreement to reconvey property on the repayment of a sum of money, made with the vendor, who has given an absolute deed, is in effect a mortgage, and the vendor has an insurable interest. *Kelly* v. *The Liverpool and London and Globe Ins. Co.* H. T. 1871. Stev. Dig. 3rd ed. 422.

(ii). *Widow — Leasehold* — A widow who has continued in possession of and paid the ground rent for property of which her husband was lessee has an insurable interest. *Lingley* v. *The Queen Ins. Co.* 1 Han. 280.

(iii). *Lien for advances* — A person who has made advances to the builder upon a vessel, then in course of construction, upon the faith of a verbal agreement with him that after launching, the vessel should be placed in the lender's hands for sale, he to reimburse himself out of the proceeds and pay surplus to the builder, has an insurable interest and is entitled to receive from the company, the facts having been fully disclosed to them. *Clarke* v. *Scottish Imperial Ins. Co.* 4 Can. 192.

(iv). *Tenancy by the courtesy* — Husband has an insurable interest in property held by his wife in fee as tenant by the courtesy initiate; and where A insured property and then gave a deed of it to B, who conveyed to A's wife, held that the policy was not annulled. *Caldwell* v. *Stadacona Fire and Life.* 11 Can. 212.

(v). *Agreement to purchase* — A person in possession of property under an agreement to purchase the same by instalments, some of which have been paid, and who has improved the property by various outlays, has an insurable interest although he could not have demanded possession till after the policy was issued. *Humphrey* v. *London and Lancashire Ins. Co.* 2 N. S. D. 39.

Insurable Interest—(*Continued*).

(i). *Assignment of property*—Where one T. conveyed his interest in the property insured to W., but the policy remained in T.'s name, W. paying the premiums, which the company took with knowledge of the facts, the company having accepted the premiums with full knowledge, must be taken as intending to deal with W. as owner of the property, although the policy contained an assignment from T. to W., T. having then no interest whatever. *Wyman* v. *Imperial Ins. Co.* 16 Can. 715.

(ii). *Mortgagor*—Insurance on ice, houses and implements. There was an agreement between P. and plaintiff that latter should cut and store ice and load it on board vessels, and should receive $1.25 per ton for all ice shipped and an advance of 60 cents per ton for ice housed; that till the completion of the contract the houses and implements should belong to P., who had a lease of the land on which the houses stood, afterwards transferred to plaintiff, to whom lessor agreed to renew; and that all profits were to be equally divided among P., S. and plaintiff. The policy was issued one month after this agreement. Plaintiff received some $3,000 on account of ice housed and stored, but no ice was shipped. Held, that the whole property was substantially plaintiff's, and verdict for full amount claimed was allowed to stand. *North British and Mercantile Ins. Co.* v. *McLellan.* 21 Can. 288.

(iii). *Renewal*—There must be an insurable interest when the insurance is effected. The existence of an interest at the time of renewal does not change the rule as the renewal is merely a continuance of the original insurance. Interest of insured was that of mortgagee; interest proved at time of trial that of absolute owner. *Howard* v. *Lancashire Ins. Co.* 11 Can. 92.

Leased Ground.

(iv). *Condition — Application* — A policy containing a condition that it should be void if the building insured stood upon

Leased Ground — (*Continued*).

leased ground and it was not so represented to the company, is rendered void by a breach of the condition, although in the company's form of application signed by the assured no question was asked as to this. *Ross* v. *The Citizens Ins. Co.* 19 N. B. 126.

Limitation of Actions.

(i). *Conditions as to* — Although by one condition assured was debarred from bringing action until sixty days after completion of proofs, the breach of another which provided that action must be brought within six months next after the loss or damage occurs, precluded him from recovering. *Blair* v. *Sovereign Fire Ins. Co.* 7 R. & G. 372.

(ii). An amendment was granted allowing a party to be added as plaintiff in a pending action although the time allowed in the policy for the commencement of the suit had elapsed. *Doull* v. *Western Ass. Co.* 6 R. & G. 478. Reversed, 12 Can. 446, on other grounds.

Loss.

(iii). *Destruction of property before issue of policy* — Sub-agent at Newcastle of L. & L. Co. received renewal premium and sent notice to agent at St. John to issue a policy. The latter applied to agent of defendant company, who took particulars from books of L. & L. Co. and issued a policy dated October 16, covering property from October 2, the date of expiry of former. Loss took place October 13. Assured, who was ignorant of the proceedings with the policies, did not give notice till after October 16. No fraud was imputed to either party. Held, that assured could recover, the proceedings amounting to a re-insurance; that the policy covered the property from October 2, and that the condition as to disclosing of state of property related to time from which policy took effect. *Giffard* v. *Queen Ins. Co.* 1 Han. 432.

Loss — (*Continued*).

(i). *Insured preventing extinguishment of fire* — A plea that after the commencement of the fire the insured wilfully and wrongfully prevented the extinguishment thereof is an answer to the whole cause of action. *Gibson* v. *The North British and Mercantile Ins. Co.* 3 Pug. 83.

(ii). *Payment of, refunding after — Duress* — Plaintiff, having collected insurance from the defendants, refunded it on their demand, the plaintiff having collected other previous insurance in another company. Plaintiff sued to recover the amount he had refunded on the ground that he paid it under threat of criminal prosecution. He swore that before he refunded the money the defendants' agent threatened to prosecute him for perjury unless he did so; that he had no knowledge of the statement in the policy that there was no previous insurance, and that if there was such a statement in the proof of loss which he signed it must have been added after he signed it. These statements were contradicted by the defendants' witnesses. The Judge charged that in his opinion the evidence was insufficient to shew that the money was repaid under extortion or undue pressure, but left it to them to find whether it was so extorted from him, stating that in his opinion the plaintiff's evidence was completely negatived by the defendants. Held, that a verdict for the plaintiff was not perverse, there being evidence on both sides on the question of extortion. *Campbell* v. *The Glasgow and London Ins. Co.* 30 N. B. 332.

Mortgage.

(iii). *Covenant to insure — Interpleader* — Where a mortgagor insured for his own benefit, instead of mortgagee's, the latter is entitled to interplead in an action against the company by the mortgagor. *McKenzie* v. *Ætna Ins. Co.* R. E. D. 346.

(iv). *Value of property — Condition requiring disclosure* — A mortgagor may insure to the value of his property without disclosing the encumbrance unless there is a stipulation in the policy requiring it. *Perkins* v. *The Equitable Ins. Co.* 4 All. 562.

Mortgage—(*Continued*).

(i). *Disclosure of—Materiality*—There being encumbrances on and a lease of the premises insured and there being nothing in the policy requiring the disclosure thereof the question of materiality of non-disclosure is properly left to the jury. *Perkins* v. *The Equitable Ins. Co.* 4 All. 562.

(ii). *Payment of—Discharge of policy*—Where a mortgagee insures solely on his own account it is only an insurance of his debt and if the debt is paid or the mortgage discharged the policy ceases to have any operation. *Gaskin* v. *The Phœnix Ins. Co.* 6 All. 429.

(iii). *Foreclosure—Extinguishment of interest*—After foreclosure a person cannot recover on a policy effected by him on his interest as mortgagee as such interest was extinguished by the foreclosure. *Gaskin* v. *The Phœnix Ins. Co.* 6 All. 429.

Notice of Loss.

(iv). "*Forthwith*"—Notice sent six days after fire and received nine days after is sufficient fulfilment of condition requiring notice "forthwith." (The assured lived in Sydney and agents in Halifax.) *Peppit* v. *North British and Mercantile Ins. Co.* 1 R. & G. 219.

Occupation of Premises.

(v). *Increase of risk—Fraudulent Intent*—Ceasing to occupy a house without fraudulent intent is not an increase of the risk within the meaning of a condition that the insurance shall be void if the building is occupied in any way so as to render the risk more hazardous, unless it be proved that destruction by fire is more probable than if the insured continued to occupy it. *Foy* v. *The Ætna Ins. Co.* 3 All. 29.

(vi). *Cesser of—Part of premises*—Where the property consisted of a house and two barns and the house was unoccupied part of the term, held, that this was a breach of condition

Occupation of Premises — *(Continued).*

requiring cesser of occupation to be given notice of and consented to. *Bishop* v. *Norwich Union Fire Ins. Co.* 25 N. S. 492.

(i). *Change of risk* — Use of property, described in application as a spool factory, in manufacturing excelsior is a breach of warranty under a condition relating to hazardous businesses and a change material to the risk. *Sovereign Fire Ins Co.* v. *Moir.* 14 Can. 612.

(ii). *Season of year* — The fact that a mill could not be worked till due season and that there was a temporary suspension of work owing to a dam being carried away, building of new one and postponement of work till increase of water in autumn does not render policy void for misrepresentation or concealment touching the risk, the statement in application being that the building was occupied as a water power saw mill and that insurance was to be on it and machinery in use therein. *McGibbon* v. *Imperial Fire Ins. Co.* 2 R. & G. 6.

Other Insurance.

(iii). *Apportionment* — A condition that other insurance whether valid or not shall be considered as contributory insurance and liable *pro rata* in case of total or partial loss applies whether anything be recovered from the other company or not so long as its policy once attached. *Hammond* v. *Citizens Ins. Co.* 26 N. B. 371.

(iv). *Invalid Policy* — Assured is bound to give notice of a second policy effected by him, whether valid or not. *Campbell* v. *Ætna Fire Ins. Co.* Cochran 21.

(v). *Notice of — After loss* — A condition requiring the assured to forthwith give notice to the company of any other insurance and have a memo. thereof indorsed on the policy does not apply to a case in which the application for other insurance was accepted on the day on which the property insured

Other Insurance — (*Continued*).

was destroyed, and notice of such acceptance did not reach the assured until after loss. *The Commercial Union Ass. Co.* v. *Temple.* 29 Can. 206.

(i). *Foreign law* — *Evidence* — A condition in a policy stated that it should be void if the insurers were not notified of any other insurance and it were not indorsed on the policy. At the time of effecting insurance with the defendants the plaintiff had other insurance in a company in Maine in the name of M. Held that defendants, in order to avoid their policy for want of notice, should have shown that by the law of Maine the plaintiff could recover the insurance effected by M., as by the law of this country neither he nor the plaintiff could recover. *McLachlan* v. *The Ætna Ins. Co.* 4 All. 173.

(ii). *Different property* — The fact that the second policy covers additional goods besides those included in the first does not obviate the necessity of giving company notice of the second policy. *Hayden* v. *The Stadacona Ins. Co.* 2 P. E. I. 242.

(iii). *Waiver* — Where it is required by policy that notice of other insurance should be given and that waiver of any condition should be endorsed on the policy, signed by the manager for Canada of the company, the fact that agent told plaintiff he could insure in other companies is not a waiver of condition and plaintiff cannot recover. *Hayden* v. *The Stadacona Ins. Co.* 2 P. E. I. 242.

Ownership.

(iv). *Agent filling in answers* — *Incumbrances* — Where agent takes application, question as to incumbrances being unanswered, and afterwards fills in a negative, the fact that the property is incumbered is no defence. *Lepage* v. *Canada Fire and Marine Ins. Co.* 2 P. E. I. 322.

(v). *Entire* — *Mortgage* — Silence as to an outstanding mortgage is a breach of condition requiring the application to state if the interest of assured is other than entire, unconditional, and sole. *Kennedy* v. *Agricultural Ins. Co.* 1 R. & C. 433.

Ownership—(*Continued*).

(i). *Entire—Mortgage*—The fact that there is a mortgage outstanding on part of the property insured, verbal notice of which only is given, is a breach of condition requiring that if the interest of assured is other than entire, unconditional and sole, it shall be so expressed in the policy. *McLeod* v. *Citizens Ins. Co.* 3 R. & C. 156. But see *Temple* v. *Western Ass. Co.* S. C. N. B., T. T. 1900.

(ii). *Application—Incorporation in policy—Misrepresentation*—A condition provided that if the application was referred to in the policy it should be considered a part of the contract and a warranty and any false representation of the condition, situation or occupancy of the property should avoid the policy. In the application the assured stated that he was the sole owner of the property to be insured and of the land on which it stood, whereas it was to his knowledge and that of the sub-agent, who secured the application, situate upon the public highway. In the policy the property was described as situate on the north side of the Great Road etc., "as per diagram filed with application." Held, that the application was referred to in the policy within the meaning of the condition and was therefore a part of the contract, and the misrepresentation as to the ownership of the land avoided the policy. *The Norwich Union Fire. Ins. Co.* v. *LeBell.* 29 Can. 470.

Pleading.

(iii). *Plea—Change of risk*—A plea stating that there was a change in the risk not made known to the defendants is bad in not alleging what the change in the risk was. *Long* v. *Phœnix Ins. Co.* 34 N. B. 223.

(iv). *Plea—Condition precedent—Fraud*—Plaintiff alleged that he gave all notices, made all proofs and performed all conditions, etc., and further alleged a waiver of notice and proofs of loss. Pleas that there was no waiver of notice and proofs of loss and that the documents tendered as

Pleading—(*Continued*).

proofs of loss were false and fraudulent are good on general demurrer. *Gibson* v. *The North British and Mercantile Ins. Co.* 3 Pug. 83.

(i). *Plea—Conditions precedent—Breach*—A plea averring that action was not commenced within six month from loss and that it was not sustainable under the conditions of the policy is bad under R. S. N. S., c. 94, ss. 151, 152, unless it allege or set out the conditions so providing. Similarly a plea that the insurance was terminated by notice. *Caldwell* v. *Stadacona Fire and Life Ins. Co.* 1 R. & G. 259.

(ii) *Plea—Duplicity*—A plea which first traverses an allegation of the delivering of an account according to a condition, and secondly sets up fraud, is not double. A plea that plaintiff was required to deliver an account in writing, etc., and to permit extracts to be taken, etc., and that he refused, is not double. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(iii). *Plea—False swearing*—A plea alleging false swearing in a statement annexed to a declaration of loss is bad for not averring that such statement was annexed, when and before whom the oath was made, and in what particular the statement was false. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(iv). *Plea—Fraud*—The defence that a condition of policy required a statement in the claim of loss of the whole actual cost value of property, and providing that any fraud or false swearing should vitiate the claim, is sufficiently pleaded by a plea alleging that L., to whom the policy was issued, delivered a false statement of loss overestimating the amount of damage and of loss incurred. *Gastonguay* v. *Sovereign Fire Ins. Co.* 3 R. & G. 334.

(v). *Declaration—Limitation as to bringing action*—A condition in a policy that no suit shall be sustained against the insurer for the recovery of any claim under the policy un-

Pleading—(*Continued*).

less commenced within twelve months after cause of action accrued is the the subject of a plea and any averment respecting it in the declaration is surplusage. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(i). *Plea — Misrepresentation — Judgments and execution* — To a declaration on a policy, issued the first January, 1893, the company pleaded that it was made a condition precedent to its issue that it was based on the representations contained in the application upon which a policy in the A. company was issued, and that although in said application plaintiff represented that there was no judgment or execution against him, yet there was a judgment signed against him on the fifteenth June, 1891, and an execution was in the hands of the sheriff at the time the defendant's policy was issued and at the time the property was burned. Held, that the plea was bad in not alleging that there was a representation that there was no judgment against the plaintiff at the time the defendant's policy was issued. *Long* v. *Phœnix Ins. Co.* 34 N. B. 223.

(ii). *Plea — Other insurance* — Where it is sought to prove that other insurance was effected on the property by a stranger, which, by a condition of the policy in suit would prevent assured from recovering more than a proportion of the amount insured, such defence must be pleaded. Verbal evidence of contents of the policy issued to the stranger is inadmissible. *North British and Mercantile Ins. Co.* v. *McLellan.* 21 Can. 288.

(iii). *Plea — Traverse of interest* — A traverse in a plea that the plaintiff was not interested in the goods insured to the whole amount of their value is too large. If he was interested in any part he is entitled to recover. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(iv). *Plea — Traverse of performance of conditions* — A plea traversing an allegation of the performance of all acts required by a condition in policy is good according to the common law rule. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

Pleading—(*Continued*).

(i). *Plea — Traverse of performance — Waiver* — Defendants pleaded *inter alia* breach of conditions voiding the policy. Plaintiff joined issue on all the pleas. Held, that he could not shew waiver, but should have alleged it in his declaration. *Martin* v. *Mutual Fire Ins. Co. of Central Ontario.* 3 Pug. 157.

(ii). *Plea — Warranty* — A plea to an action on a fire policy stated that before the policy issued the plaintiff made a warranty that the supply of water power to his mill was ample during the whole year; that such statement was material in estimating the risk, and the policy was issued on the faith of such warranty. Held, that the plea was not bad in not stating that the warranty was a part of the contract of insurance. *Copp* v. *The Glasgow and London Ins. Co.* 30 N. B. 197.

(iii). *Plea — Withholding material facts* — A plea stating that the plaintiff had withheld the fact that there was a judgment against him is bad in not alleging that said fact was material. *Long* v. *Phœnix Ins. Co.* 34 N. B. 223.

(iv.) *Declaration — Condition precedent — Videlicet* — In a declaration on a policy the respective times of the performance of acts in compliance with the conditions of policy being laid under a *videlicet*, the performance of these acts whether in due season or not is a matter of evidence. *Ketchum* v. *The Protection Ins. Co.* 1 All. 136.

(v). *Replication — Waiver — Departure* — A replication which seeks to vary a policy by a verbal agreement of waiver of a condition and by which it does not appear that there was any consideration for the alleged waiver nor that such waiver was subsequent to the date of the policy, is bad. *Nickerson* v. *Commercial Union Ass. Co.* 33 N. B. 250.

Policy.

(vi). *Description of property plan — Plans varying from body of application* — A policy on goods described them as contained

Policy—(*Continued*).

in a building shewn on a plan on the back of application as "Feedhouse" attached to assured's dwelling. The building marked "Feedhouse" did not in any way correspond with the description in the policy, but another building marked "Woodhouse," and containing the goods, answered the description. Held, that the case was a proper one for the application of the maxim "*falsa demonstratio non nocet*," and that the part of the description which was false should be rejected, and the policy held to attach to the goods in the building where they really were. *Connely* v. *The Guardian Ass. Co.* 20 Can. 208.

(i). *Construction — Month* — Month in a policy of insurance means calendar month, a policy being a mercantile instrument. *Pomares* v. *Provincial Ins. Co.* Stev. Dig., 3rd ed. 432.

(ii). *Construction* — Breach of warranty in an application as to value does not prevent a recovery where another condition permits recovery of such proportion of the actual value as the amount insured bears to the value given in the application. *Doull* v. *Fire Ins. Co.* 6 R. & G. 511.

(iii). *Construction — "Occurs"* — Loss or damage "occurs" when the fire takes place; not when the claim accrues. *Blair* v. *Sovereign Fire Ins. Co.* 7 R. & G. 372.

Proofs of Loss.

(iv). *Fraud — False swearing* — Pleas alleging that plaintiff swore falsely as to value of property and that in stating a mortgage he stated a less amount than that actually due are not good unless it be shown that affidavits, in which was the falsity, were part of the proofs and that the false declaration was made knowingly and wilfully and that it was material. *Steeves* v. *Sovereign Fire Ins. Co.* 20 N. B. 394.

(v). *Loss payable sixty days after — Condition precedent* — Proof of loss and proof of interest in the property are conditions precedent to the plaintiff's right to recover in an action on

Proofs of Loss—(*Continued*).

a policy containing a proviso that the loss was to be paid within sixty days after such proof. *Robertson* v. *The New Brunswick Marine Ins. Co.* 3 All. 332.

(i) *Particular account of loss — Whereabouts at time of fire —* Plaintiff, in his proof of loss, stated that he was in Sunbury at time of loss and was unable to ascertain how it originated. The evidence on the trial showed that he was in King's county, on his way to Sunbury, and that at the time of the fire the house was locked. Held, that it was the duty of the plaintiff, under a condition in the policy requiring that within fourteen days after loss as particular account of the same as the nature of the case would admit of be delivered to the company, to state that the house was locked at the time of the fire, and the circumstances of his leaving, and that his statement that he was in Sunbury was false and avoided the policy. An account of the loss delivered within fourteen days from knowledge of the same is in time. *Smith* v. *The Queen Ins. Co.* 1 Han. 311.

(ii). *Proof by assignor* —The assignee B. of goods and of a policy of insurance thereon issued to A., assigned goods to C. to secure a sum less than their value and with company's assent assigned the policy by an assignment absolute on its face. Held, that proofs of loss were properly made by B. and that the company was not discharged by failure to notify them that the assignment was by way of security only. *Stevens* v. *Queen Ins. Co.* 32 N. B. 387.

(iii). *Preliminary proofs* — Even if it is necessary that proofs should be furnished to the agent instead of to the sub-agent with whom assured dealt, the fact that they were prepared five days after the fire and received by the agent "early in February," being due February 2, is sufficient evidence for a jury to presume due receipt. *Peppit* v. *North British and Mercantile Ins. Co.* 1 R. & G. 219.

(iv). *Itemized account* — An affidavit by assured stating that his books and papers were destroyed, that he had no means of

Proofs of Loss — (*Continued*).

estimating his loss, describing part of the property in general terms, and giving a rough guess at amount, is not a compliance with a condition requiring particular account of loss and of value of property, the condition contemplating an itemized account. *Nixon* v. *Queen Ins. Co.* 23 Can. 26.

(i). *Preliminary proofs* — Where proofs are required to be delivered at company's office delivery at the office from which the policy was issued is sufficient. *Bowes* v. *National Ins. Co.* 20 N. B. 437.

(ii). *Condition precedent* — The stipulation that proofs must be given in fourteen days after loss and providing that no claim shall be payable until they are, is a condition precedent. *Commercial Union Ass. Co.* v. *Margeson.* 29 Can. 601.

(iii). So a condition requiring a particular account of loss to be delivered in fifteen days after the fire. *Atlas Ass. Co.* v. *Brownell.* 29 Can. 537.

Salvage.

(iv). If the jury have not given company credit for net proceeds of property saved the verdict will be set aside. *McLeod* v. *Citizens Ins. Co.* 3 R. & C. 156.

Waiver.

(v). *Proofs of loss — Certificate* — The fact that agent was silent when the failure to comply with the condition as to certificates was explained to him, he having previously insisted on an exact compliance with the requirements, was held no evidence of waiver. *O'Connor* v. *Commercial Union Ass. Co.* 3 R. & C. 119.

(vi). *Proofs of loss* — A stipulation requiring that waiver of any condition in the policy should be indorsed thereon does not apply to proof of loss nor to the steps to be taken by assured after the fire but to conditions involved in the creation of the contract. Where the policy was burnt and letter from the company showed a waiver, the correspondence was

Waiver—*(Continued).*

considered a sufficient "written declaration." *Bowes* v. *National Fire Ins. Co.* 20 N. B. 437.

(i). *Proofs of loss*—Agent expressed intention to have an investigation, said there would be no delay in payment when proofs of loss were made out and later said that the papers had gone to England and that nothing could be done till they were returned, but made no objection to the proofs. Held, no waiver of defects in the proofs of loss. *Howard* v. *Lancashire Ins. Co.* 5 R. & G. 172. Affirmed 11 Can. 92, on other grounds.

(ii). *Proofs of loss—Agent or adjuster*—Compliance with a condition cannot be waived by acts of an agent or of an adjuster or other officer where the policy requires a waiver to be in writing signed by the company's Montreal manager. *Atlas Ass. Co.* v. *Brownell.* 29 Can. 537. Revg. 31 N. S. 348. See also *Western Ass. Co.* v. *Doull.* 12 Can. 446.

(iii). *Proofs of loss—Acts of adjuster*—A person not an officer of the company appointed to adjust loss and report thereon is not an agent of the company to waive compliance with conditions as to proofs of loss. Even if he had such authority, and the time for proving loss had expired, he cannot extend the time without express authority from the company. *Atlas Ass. Co.* v. *Brownell.* 29 Can. 537. Revg. 31 N. S. 348.

(iv). *Proofs of loss—Acts of agent—Written indorsement*—Agent after receipt of defective proofs of loss, offered to compromise claim, the policy required waiver of any conditions to be indorsed thereon. Held, even if a waiver could be made without an indorsement the acts of the agent did not amount to a waiver. *Logan* v. *Commercial Union Ass. Co.* 13 Can. 270.

(v). *Proofs of loss*—Attorney of assured told agent that proofs were ready except certificate which he said he doubted if he could get in time. The agent replied it was not material and to get it as soon as he could. Held, evidence of waiver. *Crozier* v. *Phœnix Ins. Co.* 2 Han. 200.

Waiver — (*Continued*).

(i). *Proofs of loss — False swearing* — The fact that company did not require further preliminary proofs when it might have done so will not affect its right to avail itself of the objection that there had been false swearing, nor will the fact that agent gave evidence under 21 Vict., c. 48 as to origin of fire be evidence of a waiver of objection. *Cashman* v. *London and Liverpool Fire Ins. Co.* 5 All. 246.

(ii). *Proofs of loss* — Sub-agent of company in accordance with conversation with assured had loss estimated. He stated that he did so for the company's benefit. Agent refused to accept the estimate; subsequently he had conversation with assured but nothing was arrived at. Held, no evidence of waiver of preliminary proofs. *McKean* v. *Commercial Union Ass. Co.* 21 N. B. 583.

(iii). *Proofs of loss — Silence* — The taking of proofs of loss without objection is not a waiver. *Steven* v. *Phœnix Ins. Co.* 32 N. B. 394. *McManus* v. *Ætna Ins. Co.* 6 All. 314.

(iv). *Proofs of loss — Particular account* — A condition requiring a particular account of the loss is waived where the company's adjuster who had full access to papers, etc., and estimated the loss, gave no account of quantities and descriptions of goods, and the company cannot object that all possible information has not been furnished. *Kirk* v. *Northern Ins. Co.* 35 C. L. J. 82.

(v). *Proofs of loss — Lapse of time* — Property having been burnt during assured's absence from home, he notified company's agent, who replied, "Get the information (required) after you get home as soon as possible and that will do." Insured did so. Held, evidence justifying jury in finding a waiver. *Cann* v. *Imperial Fire Ins. Co.* 1 R. & C. 240.

(vi). *Proofs of loss — Estoppel* — The company, by wrongfully withholding policy, is estopped from claiming that due proofs of loss have not been given, and from setting up a condition requiring waiver of any condition to be in writing. *Caldwell* v. *Stadacona Fire and Life Ins. Co.* 11 Can. 212.

Waiver — (*Continued*).

(i). *Proofs of loss — Compromise* — Company sent an adjuster who estimated loss, prepared proofs and gave them to the general agent. The latter wrote the local agent that a cheque for the amount agreed on would be sent in due course and the local agent as authorized communicated this to assured. Held, that the company was bound thereby. *Kirk* v. *Northern Ins. Co.* 35 C. L. J. 82.

(ii). *Other insurance — Acts of adjuster* — Waiver of defence of other insurance is not established by acts of an adjuster or of an agent, neither of whom have authority to make such, the policy having become of no effect on the subsequent insurance being placed. *Western Ass. Co.* v. *Doull.* 12 Can. 446.

(iii). *Payment of premium* — Where sub-agents of company have on three occasions accepted premiums after they accrued due and have issued renewals before the payment of the premiums, the agent of the company being privy to this mode of proceeding their acts amount to a waiver of condition requiring payment of premiums at commencement of risk. *Peppit* v. *North British and Mercantile Ins. Co.* 1 R. & G. 219.

(iv). *Agent's authority* — An agent with power limited to receiving and forwarding applications for insurance has no authority to waive a forfeiture caused by a breach of condition. *Torrop* v. *Imperial Fire Ins. Co.* 26 Can. 585.

(v). *Agent or Adjuster* — Neither the local agent nor an adjuster sent to investigate the loss has authority to waive compliance with conditions precedent, or to extend the time limited for their fulfilment; where the policy requires it there can be no waiver unless by indorsement in writing thereon. *Commercial Union Ass. Co.* v. *Margeson.* 29 Can. 601.

Warranties.

(vi). *Application — Answers in* — In an application in a form for insurance containing questions which are declared to be the

Warranties — (*Continued*).

basis of the contract, the answer to the question "is the property involved in law or mortgaged; if the latter to whom and for what amount" is a warranty, and if untrue renders the policy void. That being an essential part of the contract its materiality is not a question for the jury. *Marshall* v. *The Times Fire Ins. Co.* 4 All. 618.

(i). *Materiality* — Unless the application for insurance is made part of the policy by insertion or reference, the statements in it are not warranties but collateral representations, which would not avoid the policy unless the misstatements are material. And even if it be part of the policy, and the statements are warranties, if assured has only alleged that his answers are true so far as known to him and material to the risk, the materiality and assured's knowledge are questions for the jury. *North British and Mercantile Ins. Co.* v. *McLellan.* 21 Can. 288.

(ii). *Verbal warranty* — The policy provided that statements in application should be warranties by insured. The fact that defendant verbally agreed that the statements should not be warranties as the plaintiff did not know the exact facts, was no evidence of waiver. *Dingee* v. *Agricultural Ins. Co.* 3 Pug. 80.

Will.

(iii). *Construction* — Effect of questions in will as to application of insurance monies when loss occurs in testator's lifetime. *Merritt* v. *Wright.* 21 N. B. 135.

TABLE OF CASES.